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AUTHOR Casserly, Patricia L.; Rock, Donald

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ABSTRACT

The project was designed to study factors within secondary schools that tend to affect young women's enrollment, perseverance, and achievement in extensive programs in mathematics, since mathematics is the "critical filter" to entrance and advancement in an increasing number of academic and professional fields. A sample of eight high schools that had a significant number of advanced placement (AP) mathematics candidates was chosen; with two selected to represent each of the following patterns: (A) high participation by females in AP classes and taking the AP examination; (B) high female participation in AP classes, low proportion taking the exam; (C) average female participation in AP classes, with high proportion taking the AP exam; and (D) average female AP class participation, average or low proportion taking the examination. Among the results, the questionnaires and interviews were seen to confirm the importance of AP and other mathematics teachers as counselors and mentors in the lives of students. Further, both the male and female students sampled tended to regard discouragement as a challenge to be overcome by extra effort. (MP)

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CHAPTER 10

Factors Related to Young Women's Persistence and Achievement in Advanced Placement Mathematics

Patricia L. Casserly and Donald Rock

Educational Testing Service
Development Research
Rosedale Road
Princeton, NJ 08540

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Introduction

There have long been many barriers to sexual equality of opportunity in the worlds of both work and academe. Legislation has removed some. Others have fallen before society's gradually increasing awareness of the personal and societal costs of sex-stereotyped expectations and opportunities. Yet the potential gains from these changes are still only partially realized because many young women, and those who counsel them, fail to recognize the need for equality of preparation.

The project at hand was designed to study factors within secondary schools that tend to affect young women's enrollment, perseverance, and achievement in extensive programs in mathematics, since mathematics is the "critical filter" to entrance and advancement in an increasing number of academic and professional fields. Identifying and publicizing the factors that tend to keep young women from pursuing rigorous mathematics programs in upper secondary school will permit educators to eliminate these barriers. Conversely, those strategies and tactics found positively related to young women's continued work in these areas can then be deliberately encouraged by schools and school systems, thus assuring considerably more college-bound young women a mathematics background that will assist them in pursuing almost any field of further education they may later wish to choose.

The College Board's Advanced Placement (AP) Program, with its definitions and measures of first-year college studies done in school, provides clear and practical examples of such "extensive" programs in mathematics, among other fields. Repeated studies, both at the Educational Testing Service (ETS) and at participating colleges, have shown that qualified candidates (a) outperform, in advanced courses, otherwise similar

students who, without advanced placement in high school, completed their first-year college work at college, and (b) have a higher tendency to persist in their fields of advanced placement study than do college freshmen in similar introductory courses.

In 1979, the national ratio of females to males taking the AP mathematics examination was one to two. Yet in some schools the ratio of females to males taking the AP mathematics examinations approached or mirrored population ratios of the sexes. What accounts for this phenomenon? An initial study (Casserly, 1975), made possible by grants from the National Science Foundation and the College Board, investigated some of the factors that influenced young women to pursue AP programs in mathematics and science. Its conclusions were as follows:

1. AP courses in mathematics, chemistry, and physics provide young women an excellent curricular stimulus and preparation toward professional careers in these and related fields.

2. AP teachers in mathematics, chemistry, and physics are excellent agents for recruiting girls to these fields for study and later careers.

3. Much effective college and career counseling takes place in AP classes. Often AP teachers are the only good source within the school of specific information about the financial, academic, and professional opportunities now open to young women in these fields.

4. Many guidance counselors are poor sources of encouragement for girls interested in mathematics and the physical sciences.

5. Older girls are often credited by current AP girls as having encouraged their interest in science and mathematics and supported their determination to continue in the field.

The focus of that study was both broader and narrower than the one at hand. It was broader in that we were concerned not only with young women's participation in high-level mathematics but with their participation in advanced chemistry and physics as well. The study was narrower in the following ways:

1. It was of one year's duration, with no opportunity to follow up the young women in their later education or to learn why some who had done well in AP courses chose not to take the AP examination.

2. We concentrated on AP classes only, not on females before they enrolled in these classes.

3. We interviewed only young women in these classes, and not young men. So we knew only how females perceived the attitudes of their male peers, but not whether their perceptions were valid.

The present study expands the work of the initial study and fills in some of the obvious gaps in the knowledge and insights that it produced.

Two recent studies by Haven (1972) and Fennema (1975) have sought to answer the "Why?" of women's lack of persistence and achievement in mathematics by looking at both cognitive and affective variables. Haven (1972), identifying the characteristics of girls, teachers, schools, and communities that are associated with the selection of advanced mathematics courses in high school, found that the two most significant variables were (a) perception of the usefulness of mathematics studied in high school to future studies and occupations; and (b) interest in natural sciences as opposed to social studies. Other significant variables were encouragement by mother, father, guidance counselor, members of the mathematics department, or peers to take advanced mathematics courses.

Fennema (1976) identified two affective variables that appeared crucial in explaining sex-related differences in mathematics study in primary and secondary school. They are the tendency of females to stereotype mathematics as a male domain and their anxiety in learning mathematics. She also found sex-related differences in other affective variables such as achievement motivation in mathematics and perceived

usefulness of mathematics in careers. Others, including Hilton and Berglund (1974) and Fox (1975), found significant sex differences in the perceived usefulness of mathematics; Sherman and Fennema (1976) had similar results.

In the area of attitudes, Fennema (1974) observed that girls' self-concepts tend to decrease with age, and that even when girls are achieving better than boys in mathematics, they tend to rank themselves lower in ability. Casserly (1975) and Fox (1974, 1976) both observed that special programs and advanced courses are likely to be most beneficial to young women if a sufficient number of women enroll.

Procedure

Design Overview

In this study we chose to observe, in depth and over time, a small number of schools and selected students in them, in order to gain a better understanding of how certain specific school-related factors serve to encourage able young women to persist and achieve in mathematics. Within eight high schools, we studied the females (and their male peers) in "five-year" Advanced Placement calculus programs because (a) such an interscholastic, national criterion assured the study useful similarities among the students and the variables at hand; (b) females in 5-year mathematics programs were most likely to be those with interests and gifts related to the field; and (c) schools with such 5-year mathematics programs were most likely to have deliberately organized strategies and tactics to observe.

The School Sample

The sample of eight schools included in the study were chosen in the following manner:

1. Schools presenting at least 20 AP mathematics candidates in 1977 were identified by ETS in a statistical summary that also yielded the ratio of females to males who wrote examinations from each school. Letters to these 160 schools asked for the sex distribution of enrollment in AP mathematics classes during the current and previous two years and the ethnic, racial, and socioeconomic (SES) composition of each school.

Of the 145 schools that responded to the initial letter, 142 agreed to participate, if invited, in the study. Only public and parochial schools with a consistent record of comparatively large numbers of females in AP calculus classes in the immediate past were considered.

2. Each of the remaining schools was then assigned to one of four categories:

a. High participation (approaching 50 percent) by females in AP mathematics classes and high proportion of females taking the AP examination.

b. High participation by females in AP mathematics classes but low proportion of females taking the AP examination.

c. Average (according to national AP norms for coeducational schools) female participation in AP mathematics classes but high proportion of those females enrolled taking the AP examination.

d. Average female participation in AP mathematics classes and average or low proportion of females taking the AP examination.

3. Two schools were then picked from each of the four cells and asked to participate in the study. We tried to pick in each cell at least one school that was relatively heterogeneous in racial composition and/or socioeconomic status of the student body. We also tried for the widest possible cultural and geographic distribution. (Unfortunately, although three of the chosen schools had significant numbers of blacks enrolled, very few black students were on the accelerated mathematics track at any

time in their school careers.)

In doing this, we realized that we were deliberately limiting the sorts of data analysis that could be done. But we believed it more important to investigate the variables in question over a broad variety of schools and students for the sake of maximally valid generalizations than to settle for a more "reliable" set of findings based on a more homogeneous set of schools. The schools that ultimately participated in the study are listed alphabetically below.

Burnt Hills-Ballston
Lake Central Schools
Burnt Hills, NY 12027

Cardinal Spellman High School
Bronx, NY 10466

John Marshall High School
Cleveland, OH 44111

McKinley High School
Honolulu, HA

Newton North High School
Newtonville, MA 02160

Pittsfield High School
Pittsfield, MA

Skyline High School
Salt Lake City, UT 841[illegible]

South Eugene High School
Eugene, OR 97401

The Schedule

During the first year of the study each of the eight schools was visited for a 3- to 4 1/2-day period. During that time an extensive questionnaire was administered to all tenth-grade students in honors mathematics sequences and to the students (eleventh and twelfth graders) in AP calculus classes. At least five females from each AP class, chosen at random from class rolls, were interviewed individually, their questionnaire responses serving as a basis for the discussion. Additional young women were also interviewed to supplement, clarify, and expand some of the themes that developed. These interviews often took place in groups of two to five students.

At least two mathematics teachers (the AP teacher and the teacher of the accelerated tenth-grade mathematics course) and one guidance

counselor were also interviewed at some length. In most schools we talked with all members of the mathematics department and took advantage of the invitation to sit in on classes. We also visited the major middle schools from which the senior high schools draw, and we interviewed the teachers of algebra, and/or the head of the mathematics department and a counselor concerned with mathematics placement. A summary of the high school interviews is given in Table 1.

INSERT TABLE 1 ABOUT HERE

The following activities were accomplished during the second year:

1. In early spring, a roster was sent to each school to collect data on all of the students in the original tenth-grade sample. Data requested included tenth-grade mathematics grades, subsequent mathematics courses, and the mathematics course the students were intending to enter in the fall of 1979.

2. All teachers in the mathematics department were surveyed about their professional training and experience.

3. We revisited the schools for one to three days after the rosters were completed, intending to interview at least three young women in each of four categories: those intending to enter the AP calculus course; those taking another twelfth-grade mathematics course; those who had persisted in their study of mathematics through grade 11, but were not planning to take mathematics in the twelfth grade; and those who had dropped from the advanced mathematics track (or from mathematics entirely) after the tenth grade. But there were not enough young women in the latter three categories to permit us to follow that plan. It also seemed appropriate to interview males in the latter three categories. Males proved anxious to participate in the study, and their teachers were anxious to

Table 1

1978 Interviews by School

	School								
	1	2	3	4	5	6	7	8	Total
AP girls chosen at random	5	5	5	5	5	5	5	5	40
Additional AP students	8	12	7	7	6	13	10	5	64
Teachers	6	5	6	4	7	8	12	7	49
Counselors	3	1	1	2	1	1	2	1	12
Other adults in school	2	1	2	1	1	2	2	2	13
Middle schools	2	2	2	2	0[a]	2	2	0[b]	12

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[a] Little articulation between levels in this system; students come from scores of feeder schools.

[b] Blizzard and school closing made visits to middle schools impossible.

have them do so. A summary of the numbers of male and female student interviews conducted during the second year is given in Table 2.

We also followed up, by means of a mailed questionnaire, those students, both male and female, who had been in AP calculus classes during the first year of the study. Most of these students were now in college. The numbers and percentages responding are given in Table 3.

INSERT TABLES 2 AND 3 ABOUT HERE

The Instruments

In the first year a student questionnaire and three interview schedules were used to collect data for the study. The questionnaire was used to survey students in tenth-grade accelerated and AP mathematics classes during 1978. The questionnaire was designed to elicit four types of information: first, questions on family background, number and sex of siblings, subject's placement in the family, SES characteristics, and sources of emotional support for the student's aspirations from family, peers, and others in and outside of school; second, the student's school history, including perceived attitudes of teachers and counselors, participation in and preference for various school-related activities, and perceptions about mathematics (both retrospective and concurrent). Part Three contained 25 Likert-type items on perceptions about mathematics, "proper or desirable" adult roles for men and women, and items which we hoped would relate to self-esteem and confidence. The fourth part of the questionnaire asked the student to write, in as much detail as possible, about how she/he envisioned the same day would be 10 years hence. The questionnaire was also useful in identifying appropriate teachers and counselors for interviews, in addition to those teachers regularly assigned to AP math students, and thus allowed us to supplement the regular,

Table 2

Number of Student Interviews: Year 2

Category of Student	Sex of Student	
	F	M
AP mathematics in twelfth grade	28	11
Another math course in twelfth grade	23	15
No math after eleventh grade	18	11
No math after tenth grade	8	3
Total by Sex	77	40
Grand Total	117	

Table 3

Mailed Questionnaire to Graduates: Year 2

	Sex of Student	
	F	M
Number of questionnaires mailed	137	164
Number returned	98	104
Percent returned	72	63
Number included in data analysis	94	96

structured interviews (common to all schools) with whatever special studies proved appropriate.

Interviews were held with teachers and with counselors during the first year of the study, focusing on perceptions of each school's mathematics program, counseling activities, and general social and academic "climate." Teachers and counselors were also asked about their personal mathematics histories, their perceptions of expanding opportunities for women, and their feelings concerning acceptable life styles for women today. A separate interview schedule was used with middle or junior high school personnel. It covered the same areas outlined above, but also dealt specifically with articulation of the mathematics curriculum between the middle and senior high school.

Student interviews and questionnaires were used in the second year. The interview schedule was designed for the former tenth-grade accelerated students (now in the eleventh grade) and concentrated on their experiences in mathematics during the intervening year and other factors that had either strengthened or modified their immediate curricular choices (for the twelfth grade) or their more general long-range goals. The questionnaire, used to survey all former AP calculus students during the second year, concentrated on their perception of the articulation between high school and college work and on the appropriateness to their college careers of their AP calculus course and the colleges' action in regard to it.

Results and Discussion

This report will focus (a) on short statements about the hypotheses that shaped the study; (b) on a selected number of findings that are particularly important for educational practice; and (c) on a path-analytic solution of the relative effects of peers and adults, in and out of school,

on students' persistence and achievement in mathematics. Although a number of the response differences of the females and males are statistically significant, we feel there is also social significance in the fact that the distributions resemble each other more than we had expected.

The hypotheses outlined immediately below guided the collection and analysis of data:

1. Young women in AP and other fifth-year math classes where their proportion approaches or equals that of males will have been identified as having high mathematics ability early and put into an accelerated or enriched, homogeneously grouped mathematics program at that time.

2. AP young women took Algebra I in the eighth grade almost as a matter of course; their opportunity to opt out of fast-track mathematics went unnoticed.

3. These young women will report efforts of AP mathematics teachers or their surrogates in early senior high school to inform them of the AP program and the advantages it would provide them among their senior-year electives.

4. They will have discussed with an AP teacher their plans for college, their probable major, and their possible choice of career.

5. For these females, the sex of the AP teacher and other significant teachers is less important than other characteristics. They see their AP mathematics teachers as nonsexist, positive reinforcers of their aspirations, however nontraditional these aspirations may be.

6. When young women in these advanced classes report that their male classmates are traditionally sexist in their attitudes toward the "proper" interests and careers for women, they will also report strategies for dealing with the perceived sexism.

7. Young women's appraisals of the mathematics ability of the other females in the class will be similar to their appraisals of the males' ability.

8. The young women's confidence in their own mathematical abilities will be directly proportional to the proportion of females in the AP mathematics class.

Hypothesis one, that there would be a positive relationship between "persistence" (in the AP or fifth-year mathematics course) and early

hypothesis three.)

Hypotheses four and five have to do with the AP or advanced teachers' interactions with students, both as sources of information on the importance of mathematics in college and careers and as champions of their students' aspirations in whatever direction they might lie. Data from the previous study suggested that often AP teachers (not necessarily the AP mathematics teachers) were the only persons in the school who supported a girl's dreams and tried to raise her aspirations. Counselors also were important, but frequently only in grade 12 -- too late to encourage the necessary preparation.

The questionnaires and interviews confirm the importance of AP and other mathematics teachers as counselors and mentors (distinct from role models) in their students' lives. When students who continue mathematics in college look back at high school, the AP mathematics teacher stands out as exemplary, even in comparison to college teachers. But while students are still in school, 55 percent of the girls and 47 percent of the boys also identify teachers encountered in much earlier school years (usually in grades 4 through 7) as being crucial, first to their sense of self-worth, then to their persistence in mathematics, and to their initial career aspirations. While visiting these close-knit departments, we were similarly impressed by the teachers' active, caring conversations about their former students.

Equal but smaller percentages of girls and boys (11 percent) reported experiences that tended to depress either their confidence in their mathematical ability or their interest in the subject before high school. Both females and males tended to regard discouragement as a challenge to be overcome by extra effort. However, males somewhat more

than females tended to externalize, blaming the teacher for their difficulties, whereas females tended to internalize their difficulties, perceiving teachers as champions of persistence and allies in overcoming problems and attendant anxieties.

Hypothesis six focuses on strategies we had seen in the previous study adopted for dealing with the perceived sexism of peers. In the present study, we again found humor and plans to postpone marriage and children employed to this end, but the need for such strategies in all but two of the schools seemed relatively slight. The feminist movement is seen generally as less strident now, and the necessity for a two-income family (at least to "get started") more apparent than it was three years ago. A third explanation may be offered, in some way perhaps a function of the other two: the ratio of females to males was higher in these classrooms than in the Casserly (1975) study, and hence the hypothesized need for defensiveness had changed. For instance, young women in the present study apparently no longer needed to date outside the AP math class.

Hypotheses seven and eight deal with attitudes and perceptions of "girls" vs. "boys" and "self" vs. "others" with regard to specific mathematical ability. In only two schools were there statistically significant sex differences between the perceived mathematical ability of the students themselves and those of others of the same or other sex. These schools also had among the lowest ratios of females to males in AP calculus classes and ranked highest in sexually stereotyped behavior. There were no statistically significant differences in the relationship between students' grades in mathematics (or English) and their perceived abilities. This outcome is contrary to the findings of Fennema and others.

Broader Implications

> "We're doing something good? That's nice to hear, but I don't think we're doing anything special."
>
> "Well, we've always had a good strong math department. We're anxious to keep all students [in the mathematics curriculum] — not girls in particular. ... But not boys in particular either."
>
> "Girls are as able as boys and they need math just as much. Why wouldn't they be represented equally [in math honors courses]?"

The quotations are typical opening responses of adults in the participating schools to the initial, and the central, question of this study: Why do so many girls continue through the honors mathematics sequence in this school? The hypotheses identified some factors we expected to find. And we did find common features across the heterogeneous schools in the study, but not always the ones we expected. Also, in a few schools, there were some elements that had clearly hindered a number of highly able young women.

The entire project was, after all, an attempt to answer a number of different questions related to a common central point: What makes a mathematics department or a curriculum strong? More particularly, what makes it "successful" with young women; that is, why are they persistent?

> "Well, we're not talking about curriculum at all in the strict sense of the word. We're not talking about textbooks," one teacher explained. "We're talking about school climate, teachers' professional backgrounds and interests, and how much and how well they relate to students and to each other. To what other teachers are doing. Articulation throughout the system is important. ..."

Mathematics Teachers — What Are They Like?

Of the 75 teachers in the eight mathematics departments of the study, 53 had undergraduate degrees in "pure" math. The others held undergraduate degrees in physics, biology, engineering, electronics,

chemistry, or business. Only six had undergraduate degrees in education. Fifty-seven of the teachers held masters degrees, of which only 19 were given by graduate departments of education; four of these 19 degrees were M.S.'s, or the teacher held an M.S. in addition to the masters in education. Five additional teachers held MAT's; one held a graduate degree in engineering; two held the PhD; and two, the EdD. Although most of the degrees were in mathematics, computer science, or mathematics education, there was a broad range of fields of graduate study, extending from psychology and counseling to history, art, and Russian.

Almost half held or had held jobs in addition to teaching. About half of these were simply second jobs to supplement income. But the rest had or had had other deliberate, professional careers in research and development, engineering, electronics, community development (Peace Corps), surveying, stockbrokering, computer analysis, coaching, and even music. To almost all of the teachers in these schools, teaching mathematics represented a rewarding, positive career, not a refuge from the "real" world. A number of them were helping elementary teachers upgrade their mathematical skills -- and therewith their sense of why high school mathematics is integral to young people's education. Students in every school remarked that such teachers' experience in the "real" world made a positive difference in the way they (the students) felt about the relationship between classroom learning and everyday life. Two or three such teachers in a school are enough to make the difference.

In five of the schools, most math teachers and mathematics department heads were men; in the other three, women were in the majority or headed the department. In three of the eight schools, the AP mathematics teachers were men; but in each of the other five, the AP

mathematics teacher was a woman, or a woman taught the more advanced AP mathematics course.* In three of these five schools the same AP women teachers taught either the tenth- or eleventh-grade accelerated mathematics course and reported special efforts to encourage able young women who might be wavering to persist. The teachers were hesitant to say that the presence of women in higher level mathematics courses was related to young women's success in mathematics. However, for many of those females who had had or were having difficulty in mathematics, it seemed an important factor in their not giving up.

> "It's not that she's a woman; it's the kind of woman, the kind of person she is ... Do you know she had trouble in math once, too? I suppose it's a case of 'if she could do it, maybe I can, too,'" said one young woman of her vivacious Calculus BC teacher.

It became clear at all the schools in the study that the gender of the teacher per se was not enough to affect young women's persistence positively, but that gender and certain kinds of shared experiences could.

Like most people, teachers are rather cautious when asked to discuss the personal attitudes and experiences they bring to the classroom, but they are not shy about commenting on the strengths (and, occasionally the perceived deficiencies) of others. With three rather glaring exceptions, teachers perceived each other and were perceived by the students as expecting the same level of performance from females as from males, welcoming increased opportunities in the society for women, and encouraging able young women to aim high.

But even more important to many young women (and fewer young men) was that teachers, "rigorous but never harsh," communicated the intrinsic

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*There are two AP calculus courses. Calculus AB covers a semester of precalculus and one semester of calculus. Calculus BC covers 2 semesters of calculus.

beauty of mathematics. Moreover, a fourth of the teachers who had encountered difficulties (accompanied by anxiety) in their own careers in mathematics communicated the idea that suffering was no reason to desert the field.

Path Analyses

This section supplements the previous discussion with a more complex analysis based on a hypothetical causal model. The unique values of this sort of causal analysis are these: (a) it is a multivariate approach that controls for other possible influences on a dependent variable, thus yielding the "net" apparent influence of any given variable on another; and (b) it provides a way to estimate the indirect effect of a prior or (apparently) causal variable on another variable two or more steps down the hypothetical causal chain.

INSERT FIGURE 1 ABOUT HERE

Figure 1 presents the traditional pictorial representation of our general causal model. This model was formulated prior to data collection to represent the relationship of variables assumed on a conceptual basis to underlie the development of young men and women in accelerated mathematics programs. The arrows going in one direction indicate the direction of the hypothetical cause and effect. Two-way arrows indicate a statistical relationship (correlation) where no causal direction is implied.

INSERT FIGURE 2 ABOUT HERE

Figure 2 is an example of the type of diagram that can be drawn after data collection to represent the relationships that were found. Here arrows are accompanied by standardized partial regression coefficients* (path coefficients) which indicate the relative importance of the variable at the tail of the arrow as a possible cause of the variable at the head.

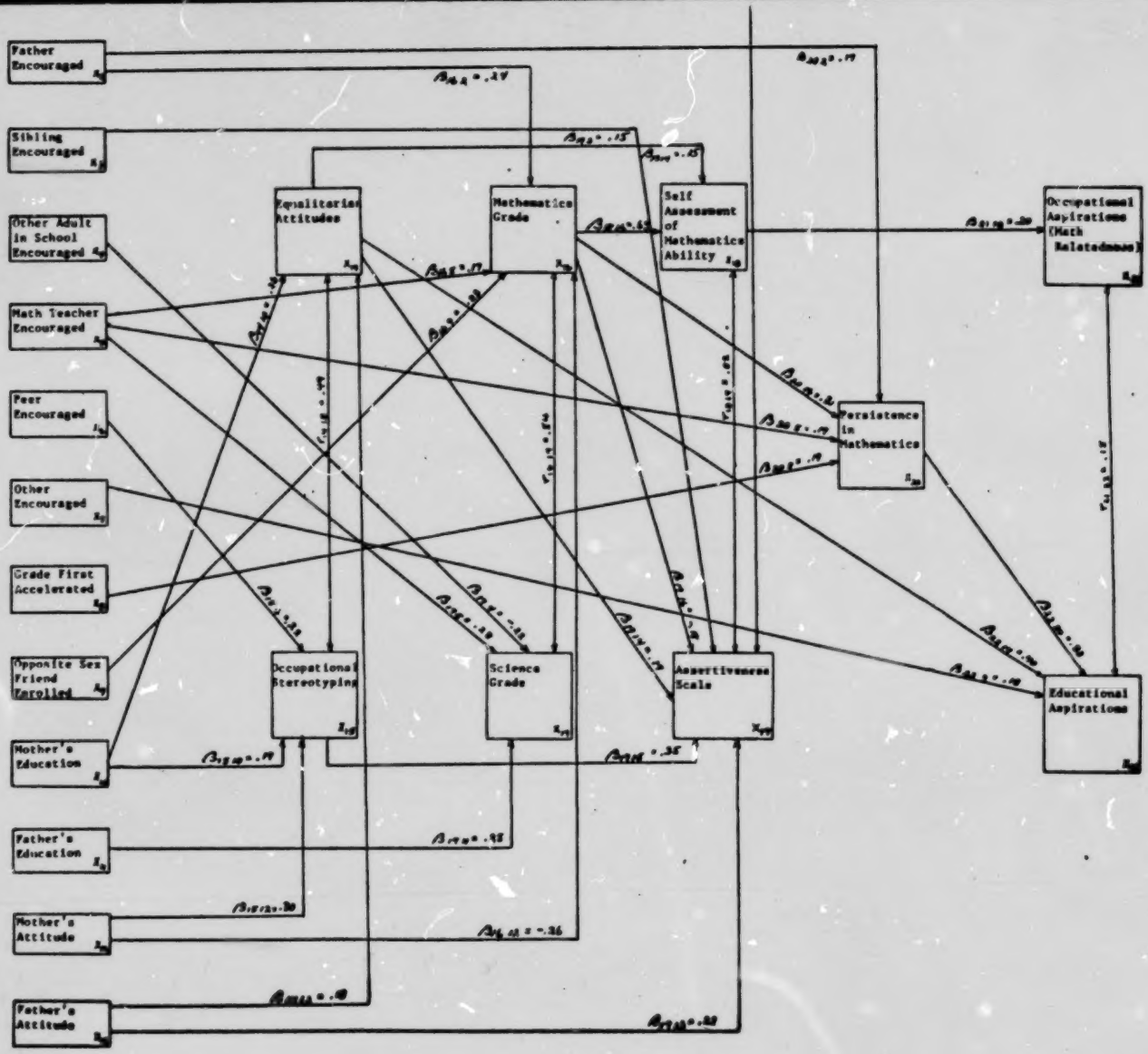

FIGURE 1

Path Analysis Model for Women in 10th-Grade Advanced Mathematics Classes

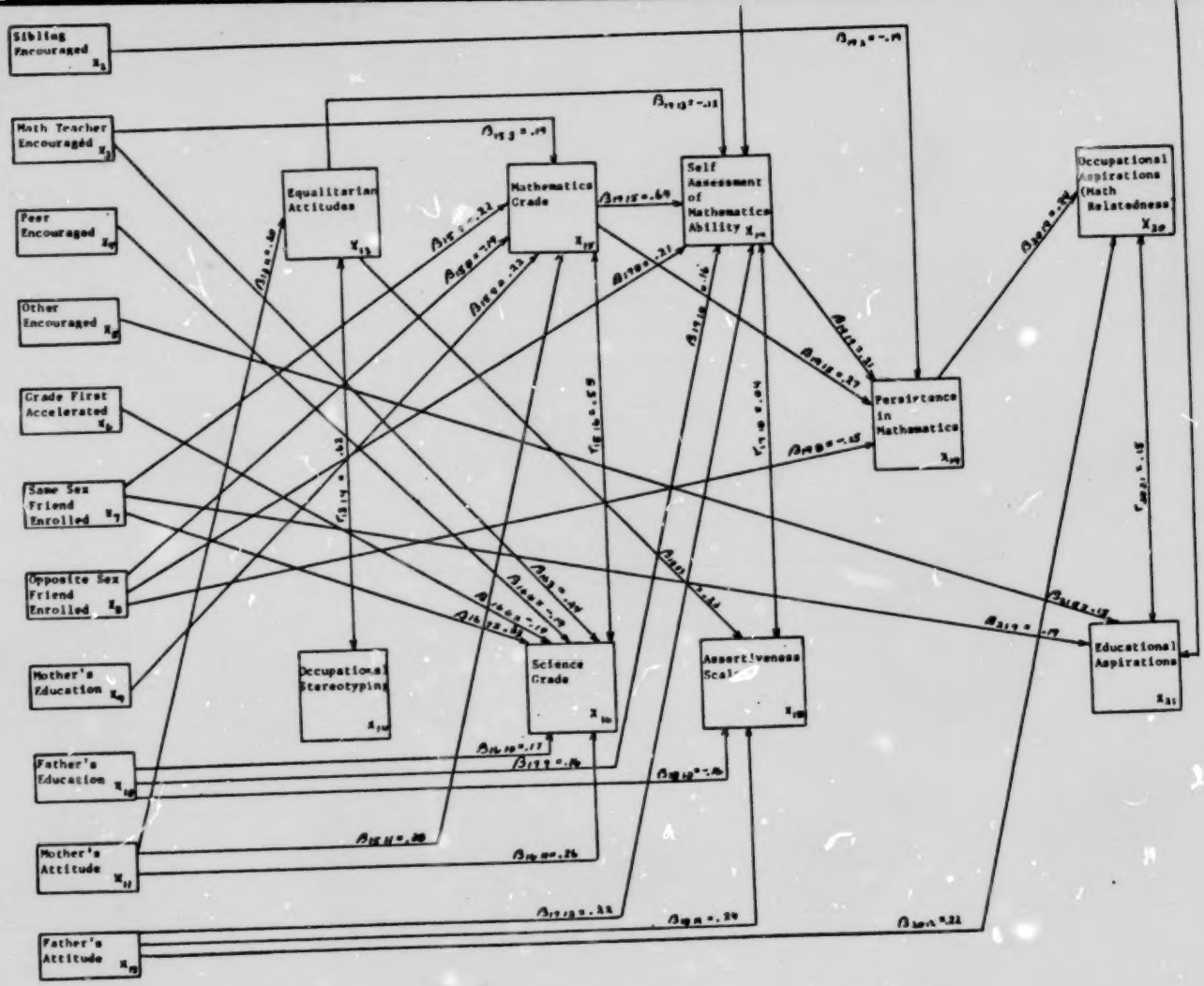

FIGURE 2

Path Analysis Model for Men in 10th-Grade Advanced Mathematics Classes

We draw similar diagrams for tenth- and twelfth-grade males and females.

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*The authors recognize that comparisons of the relative size of standardized regression coefficients across populations may lead to incorrect interpretations unless the raw score coefficients reflect the same population differences. Therefore, in this study, we will only draw conclusions about a given differential effect across populations if the raw score weight was consistent with the standardized weight.

The reader should note that path models are primarily generated on theoretical and/or logical grounds and thus may or may not accurately reflect the "true" cause; they do, however, provide an orderly means of presenting and statistically testing the reasonableness of a given explanation of complex behavior. We will take each of the "effects" boxes as shown on Figure 1 and discuss its causes from our analyses.

Equalitarian attitudes and occupational stereotyping. These scales are closely related to each other in what they measure, both conceptually and statistically (correlation coefficients ranging from .49 to .62). Consequently, it is more useful to look at them together, as attitudes towards mathematics.

For tenth-grade girls, views about the roles and abilities of men and women were related to the attitudes of their mothers and fathers. Girls tended to have more equalitarian attitudes when their fathers were supportive of their career goals (.18), and were less traditional in occupational stereotyping when their mothers had positive attitudes towards their occupational goals (.30). More liberal ideas about men's and women's roles (items from both Equalitarian Attitudes and Occupational Stereotyping scales) were also predicted by mother's education (.26 and .19, respectively).

The Equalitarian Attitudes and Occupational Stereotyping of tenth-grade males were not predicted by as many family background

variables. In fact, the only variable of any sort that predicted level of sex-role stereotyping was the mother's attitude towards the student's career or occupational goals (.20).

For the twelfth-grade AP women, family variables continued to predict sex-role stereotypes. Mother's attitude was related to equalitarian attitudes (.21) and lack of traditional occupational stereotyping was predicted by mother's education (.26) and mother's encouragement in math (.21). For young men in the AP classes, friends seemed to be more important than they were earlier in relation to views of men's and women's roles. Young men who had young women friends in the AP class had more equalitarian attitudes (.17). Those young men who felt that they received encouragement from peers for participating in advanced mathematics courses tended to be more equalitarian in their attitudes (.17) and less rigid in their occupational stereotyping (.23). Father's education was also related to both stereotyping measures, Equalitarian Attitudes (.25) and Occupational Stereotyping (.18).

Grades in mathematics and science. Both male and female tenth graders who performed at a high level in math reported that math teachers gave them encouragement (.17 for each sex). By the twelfth grade, young men's grades were no longer related to encouragement from math teachers, but young women's grades were (.25).

The math grades of the tenth-grade males were clearly positively related to their perception of mothers' attitudes towards their career goals (.38). The situation for young women was in marked contrast; there was a negative relation between math grades and mothers' approval of their career goals (-.26). It may be that the more mathematically oriented girls were encountering less enthusiasm from their mothers about their career

plans than girls who were inclined toward more traditionally feminine occupations.

For tenth graders, the presence of close friends in the accelerated math classes appeared to affect grades. For boys, same sex friends were a positive influence (.22), while for girls it was the presence of an opposite sex friend that related to higher grades (.25). Though the presence of friends in twelfth-grade accelerated math classes continued to influence self-assessment in math and persistence in taking math courses, it seemed no longer important in affecting grades.

Self-assessment of math ability. In both tenth and twelfth grades, students' self-assessment of their math ability was affected by their grades in mathematics courses to a large degree, an effect far larger than that of any other variable. Moreover, the effect was a specific one; science achievement, for instance, had no significant relationship to self-rating in math. The importance of math grades in determining self-ratings was somewhat lower for twelfth graders, though grades were still by far the more influential single variable (.54 for males and .45 for females, as compared to .64 and .65 for tenth graders).

For young men, several family and peer variables predicted math self-concept as well. Self-ratings in math were higher for tenth-grade males perceiving themselves as getting encouragement from their fathers (.13) and reporting favorable paternal attitudes toward their career goals (.22). By the time they reached twelfth grade, young men's perceptions of their fathers' support were no longer related to self-assessment in math. At this grade level, the enrollment of a same sex friend in the AP class was positively related to math grades (.21).

For girls, neither family nor peer variables affected mathematics

self-concept at the tenth-grade level, but by the twelfth grade the presence of a same sex friend in the AP class had a significantly positive effect (.25), as it did with males.

Assertiveness. This variable, which was constituted of items having to do with the willingness to speak up and reveal one's intelligence in and out of class, was related to fathers' supportive attitudes towards occupational goals both for young men (.24) and for young women (.22) at the tenth-grade level. Assertiveness was also influenced by equalitarian attitudes and lack of heavy occupational stereotyping. Tenth-grade males were higher in assertiveness when they held more equalitarian attitudes (.23). Likewise, the more assertive young women were high in equalitarian attitudes (.17) and held less tradition-bound occupational stereotypes (.35).

In the twelfth grade the relationship remained between assertiveness and non-stereotyped ideas about men's and women's roles and abilities. For young men as well as young women assertiveness continued to be predicted by low occupational stereotyping (.23 for both sexes). Equalitarian attitudes were also related to assertiveness in twelfth-grade males (.23).

A particularly interesting finding was the negative path coefficient between math grades and assertiveness for female tenth graders (-.18). This result suggests that young women who achieve at a very high level in high school calculus do not like to call attention to their gifts, while young men do not report feeling such hesitation.

Persistence in mathematics. Those who continued to take math after the tenth-grade level were those who did well in it. Both young men (.27) and young women (.31) with a record of success in mathematics tended to

stick with it.

The grade at which the student was first accelerated had a significant impact on persistence in math for tenth-grade girls (.19) but not for boys; this variable did not remain a significant predictor of whether students in twelfth-grade AP classes continued in mathematics.

For young men, the encouragement of math teachers was important in the decision to continue taking math both for tenth graders (.27) and twelfth graders (.31). For young women, math teachers' encouragement was influential at the tenth-grade level (.19) but not beyond. What did make a difference in the twelfth-grade females continuing on in math was the presence of an opposite sex friend in the AP math class (.38).

One interesting finding was the lack of relationship between young women's self-assessment in math and the decision to continue taking it. This variable played a role in persistence in math for tenth-grade males (.21); it was not measurably important for young women at any point.

Occupational aspirations. Math teacher's encouragement, which had a positive impact on math performance and on continuing to take math, had little direct effect on math-related occupational and career aspirations.

The importance influences early in high school were self-assessment in math ability for the young women (.20) and fathers' attitude (.22) and persistence in math (.24) for the young men. By the time students had reached twelfth grade, their aspirations to go into math-related careers were still predicted by their persistence in taking math, significantly for the young men (.29) and positively but not quite significantly for the young women.

The significant factors for young women were the math grades they had made (.21) and the encouragement of adults in the school other than the

math teacher (that is, other teachers, counselors, etc.) (.22). Since the young women were enrolled in a broader range of other AP fields than were their male counterparts in AP calculus, a sex difference in the influence of other adults in the school is not surprising.

Educational aspirations. Since the educational aspirations referred to the highest level of educational attainment the student planned on reaching (independent of field), it was not highly related to the occupational aspirations variable (-.07 to .15) and was predicted by a different set of variables for the most part.

However, one variable that clearly influenced level of educational aspirations of young women in AP classes (.20) as well as math-relatedness of career goals was the encouragement of adults in the school other than the math teacher. For males there was some indication that fathers' supportiveness had an impact on both aspects of further plans. This factor affected math-related occupational goals in the tenth grade (.22) and influenced level of educational aspirations in the twelfth grade (.25).

Level of educational aspirations was heavily influenced by peer effects for young men and young women in AP classes. Females were likelier to have higher educational goals when they had friends, both same sex (.20) and opposite sex (.27), in their AP calculus class. For young men the picture was more complicated. Educational aspirations were higher when males had an opposite sex friend enrolled in AP math (.19), but lower when they perceived their peers as encouraging their participation in advanced mathematics (-.21).

Young women's educational goals were strongly influenced by their feelings about women's roles in the world. In formulating their ideas about how far they would go educationally, tenth-grade women were

influenced by their equalitarian attitudes (.40) rather than by their past performance in math or their self-assessment in mathematics ability. Their perception that traditional male occupations are appropriate choices for women was related to their educational goals in the twelfth grade (.23), while past performance and self-confidence in math were still unrelated to goals. Clearly, being good at mathematics is not enough to increase women's participation in the highest levels of the educational system unless their attitudes towards women's roles are simultaneously improved.

Summary

The role of parents was most important in developing early positive attitudes towards women's roles both in male and female students. For young women these effects were virtually the only significant ones that parents exerted. For young men there was a stronger and more persistent link between parental support, on the one hand, and the students' performance, self-assessment, and setting of high educational goals on the other.

It is not clear from the data what factors resulted in this sex difference in the effect of parental support. There might actually have been less support for young women to perform well in math and plan careers based on this ability. Another possibility is that young women were less affected by parental behaviors than by other environmental factors. This is a plausible possibility since for females there is likelier to be a conflict between encouragement in the home and the expectations about women's roles and career options encountered from peers and from society in general.

The effect of peers within the advanced mathematics classes was generally a positive one for both sexes. For young women the presence of

friends in advanced classes positively affected math grades, self-concept in mathematics, the decision to continue taking math courses, and the level of educational aspirations.

Performance for both male and female students in advanced math classes was significantly related to encouragement from math teachers. This positive effect continued through the twelfth grade for young women, while it became less significant for young men at this level.

Whether young women in advanced mathematics classes pursue math-related careers and seek higher levels of education is more a function of whether they are encouraged in this direction by school personnel other than the math teachers (other teachers, counselors, etc.). By the time they are seniors in high school, young women make decisions about math-related careers on the basis of previous grades, while young men are not significantly influenced by their previous success in math classes.

On the basis of the path analyses, it appears that family, school personnel, and peers all influence young women's performance and future plans in mathematics. The family is primarily important in the development of early positive attitudes towards women's roles. The math teacher is then in the position to provide knowledge and motivation for persistence and grade performance. Finally, decisions of whether to opt for math-related careers are based on past math grades and encouragement from school personnel outside of mathematics.

Factors Related to Young Women's Persistence and Achievement in Mathematics, With Special Focus on the Sequence Leading to and Through Advanced Placement Mathematics

APPENDIXES A, B, and C

Patricia Lund Casserly and
Donald A. Rock

APPENDIX A-1

STUDENT SURVEY

QUESTIONNAIRE

1978

PART ONE

Name_____ School_____

Grade, Circle One 9 10 11 12

Age (in years and months)_____ Sex: F____ M____

Ethnicity_____

1. If you are an only child check here_____

2. If you have brothers and sisters please indicate how many of each there are in your family and your birth position among them. Make a list starting with the eldest child and working down to the youngest. Use B for brother, S for sister and X for yourself. For example, if you are the eldest and have two younger sisters, your list would look like this--XSS. If you are the fourth child in a family with five boys, your list would look like this--BBBXB. Be sure to start your list with the oldest child first.

Oldest _ _ _ _ _ _ _ _ _ _ _ _ Youngest

3. List the courses in which you are currently enrolled and your grade average. Be sure to include the course level as well as the title, i.e., "Eng 3" not just "English."

Course	Grade	Course	Grade
1._____	____	4._____	____
2._____	____	5._____	____
3._____	____	6._____	____

4. Please indicate the specific academic field and the grade level at which you first entered enriched, accelerated or honors sections. For example, some students have been placed in special or accelerated math classes as early as grade 3, 4, 5 or 6. Others followed the regular curriculum until grade 8 when they were enrolled in Algebra I. Still others studied math in special summer programs or took two math courses concurrently. Please be as specific as you can.

Academic field (please write in)	Grade level at which enrichment or accelerated work began
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

5. Is your best friend <u>of the same sex</u> also enrolled in an accelerated mathematics course?

	Circle one number
1. No	1
2. Yes	2
3. I do not have a best friend of the same sex	3

6. Is your best friend <u>of the opposite sex</u> also enrolled in an accelerated mathematics course?

	Circle one number
1. No	1
2. Yes	2
3. I do not have a best friend of the opposite sex	3

7. Rate the general scholastic ability of your best friend <u>of the same sex</u> in relation to your own. Is it?

	Circle one number
1. Higher	1
2. The same	2
3. Somewhat lower	3
4. Much lower	4
5. I do not have a best friend of the same sex	5

8. Rate the general scholastic ability of your best friend of the opposite sex in relation to your own. Is it?

	Circle one number
1. Higher	1
2. The same	2
3. Somewhat lower	3
4. Much lower	4
5. I do not have a best friend of the opposite sex	5

9. How much has each of the following persons been a source of encouragement to your participation in advanced math courses?

	(Circle one number on each line.) Not at all	Somewhat	A great deal
Mother	1	2	3
Father	1	2	3
A relative other than in your immediate family	1	2	3
A guidance counselor	1	2	3
A mathematics teacher	1	2	3
A teacher (not math)	1	2	3
A family friend	1	2	3
Older girls or boys (e.g., returning college students)	1	2	3
An adult not mentioned above	1	2	3
Boys your own age	1	2	3
Girls your own age	1	2	3
Your best friend of the same sex	1	2	3
Your best friend of the opposite sex	1	2	3
A brother or sister	1	2	3

10. Has anyone of the following ever tried to discourage you from continuing to study mathematics?

Mother	1	2	3
Father	1	2	3
A relative other than in your immediate family	1	2	3
A guidance counselor	1	2	3
A mathematics teacher	1	2	3
A teacher (not math)	1	2	3
A family friend	1	2	3
Older girls or boys (e.g., returning college students)	1	2	3
An adult not mentioned above	1	2	3
Boys your own age	1	2	3
Girls your own age	1	2	3
Your best friend of the same sex	1	2	3
Your best friend of the opposite sex	1	2	3
A brother or sister	1	2	3

What did they say?

_____

_____

_____

11. Can you remember any experiences during your grade school years either good or bad that might have affected your feelings toward mathematics in general and taking mathematics courses? If "yes," please describe.

_____

_____

_____

12. How much influence has each of the following school-related experiences had on your decision to enroll in accelerated mathematics courses?

(Circle one number on each line.)

	None at all	Some Influence	A great deal of influence
Participation in on-going special programs	1	2	3
Participation in a "one time only" special event	1	2	3
Having an older student as a model	1	2	3
Membership in mathematics or science clubs	1	2	3
Competition with students from other schools as a member of your school's math team	1	2	3
Other sources of school related encouragement. Please write in			

_____

_____

_____

13. Were you influenced toward studying mathematics by some person or experience NOT related to the school or school activities?

No_____

Yes_____ (Please explain)

_____

_____

_____

14. Think of the teacher or other adult in your high school who has had the greatest influence on you. Then answer the following questions about her or him.

a. What was or is this person's position in the school? (For example, Algebra teacher, counselor, track coach, etc.) You do not need to give their names if you prefer not to.

b. What grade were you in at the time?

c. What was this person's influence?

d. What personal characteristics does this person have that make her or him especially valuable to you?

15. Now, going back to your school years in grades one through eight, think of the teacher or other adult who had the most influence on you.

a. What was this person's position in the school? (Again, you do not need to give a name - just describe her or him.)

b. What grade were you in at the time?

c. How did this person influence your aspirations in positive ways?

d. What personal characteristics did this person have that made him or her especially valuable to you?

16. How do you rate your mathematical ability compared with the girls in your math class?

	Circle one number
1. Among the poorest	1
2. Below Average	2
3. Average	3
4. Above Average	4
5. Among the best	5

17. How do you rate your mathematical ability compared with the boys in your math class?

	Circle one number
1. Among the poorest	1
2. Below Average	2
3. Average	3
4. Above Average	4
5. Among the best	5

18. My mathematics tests and exam grades tend to:

	Circle one number
1. considerably overestimate my mathematics ability.	1
2. accurately reflect my mathematics ability.	2
3. moderately underestimate my mathematics ability.	3
4. considerably underestimate my mathematics ability.	4

19. My English tests and exam grades tend to:

	Circle one number
1. considerably overestimate my English ability.	1
2. accurately reflect my English ability.	2
3. moderately underestimate my English ability.	3
4. considerably underestimate my English ability.	4

20. Listed below are a number of statements about uses you might expect to find for the mathematics courses you have taken or are now taking. Please indicate your level of agreement with each of the following statements.

	Disagree	Mildly Agree	Strongly Agree
1. Will be of practical value in earning a living	1	2	3
2. Basic educational value	1	2	3
3. Not used to earn a living, but of some use in daily life.	1	2	3
4. Solving math problems can be fun.	1	2	3
5. Do not want to lose mathematical skills.	1	2	3
6. Need to take them now to be eligible for advanced college math courses.	1	2	3
7. Courses are related to or needed for intended major field or future work.	1	2	3
8. They represent a challenge; therefore mastery of them is rewarding to me.	1	2	3

9. Other (specify)_____

_____

_____

21. In the column under YOU, circle the number that goes with the highest level of formal education you hope to attain. Under MOTHER, circle the number that goes with the highest educational level she has attained and do the same in the column marked FATHER.

Highest Educational Level	YOU	MOTHER	FATHER
8th grade	01	01	01
Some high school	02	02	02
High school graduate	03	03	03
Trade or technical beyond high school or some college	04	04	04
College graduate	05	05	05
Some graduate study beyond college but NO advanced degree	06	06	06
Master's degree or other professional degree that is NOT doctorate	07	07	07
Doctorate (Ph.D., M.D., Ed.D., D.D.S. and the like)	08	08	08

22. Please write in your father's occupation. If he is unemployed outside the home at present, check here ☐ and then write in what occupation he had when he was working.

_____

23. Please write in your mother's occupation. If she is unemployed outside the home at present, check here ☐ and then write in what occupation she had if and when she worked outside the home.

_____

24. What are your career plans? If you are not sure, you may list several fields or types of jobs that might interest you.

_____

_____

_____

25. How frequently do you discuss your plans for continuing your education after high school with your best friend of the same sex?

	Circle one number
1. Not at all	1
2. Occasionally	2
3. A great deal	3
4. I do not plan to go to college	4
5. I do not have a best friend of the same sex	5

26. How frequently do you discuss your plans for continuing your education after high school with your best friend of the opposite sex?

	Circle one number
1. Not at all	1
2. Occasionally	2
3. A great deal	3
4. I do not plan to go to college	4
5. I do not have a best friend of the opposite sex	5

27. How frequently do you discuss career plans with your best friend of the same sex?

	Circle one number
1. Not at all	1
2. Occasionally	2
3. A great deal	3
4. I do not have a best friend of the same sex	4

28. How frequently do you discuss career plans with your best friend of the opposite sex?

	Circle one number
1. Not at all	1
2. Occasionally	2
3. A great deal	3
4. I do not have a best friend of the opposite sex	4

29. Describe the attitudes of your mother toward your occupational or career goals.

	Circle one number
1. Very supportive, very much in favor	1
2. Moderately supportive	2
3. Neither favorable nor unfavorable	3
4. Not supportive or favorable	4

30. Describe the attitudes of your father toward your occupational or career goals.

	Circle one number
1. Very supportive, very much in favor	1
2. Moderately supportive	2
3. Neither favorable nor unfavorable	3
4. Not supportive or favorable	4

31. What do most of your close friends plan to do next year?

	Circle one
Go to vocational, technical, business or trade schools	1
Start work on a two-year college degree	2
Start work on a four-year college program	3
Enter apprenticeships or on-the-job training programs	4
Go to work full-time	5
Enter the military service	6
Continue in school	7
I don't know	8
Other (specify) _____	9

32. Have you participated in any of the following types of activities, either in or out of high school?

	Circle one number on each line			
	Have not participated	Have participated but not actively	Have participated actively	Have participated as a leader or officer
Athletic teams, intramurals, letterman's club, sports club	1	2	3	4
Cheerleaders, pep club, majorettes	1	2	3	4
Debating, drama, band, chorus	1	2	3	4
Hobby clubs such as photography, model building, hot rod, electronics, crafts	1	2	3	4
Honorary clubs such as Beta Club or National Honor Society	1	2	3	4
Mathletes or mathematics competitions	1	2	3	4
School newspaper, magazine, yearbook, annual	1	2	3	4
School subject matter clubs such as science, mathematics, history, language, business, art	1	2	3	4
Service club, tutoring project	1	2	3	4
Shop courses or drafting	1	2	3	4
Student council, student government, political club	1	2	3	4
Vocational education clubs such as Future Teachers, Explorer Scouts, Computer Science	1	2	3	4

PART TWO

Below are a number of statements through which you can tell us about yourself and how you see the social world by telling us how much you agree or disagree with them. Please read each statement carefully and then circle the most appropriate response.

1. The children of mothers who stay home with them are better adjusted than those whose mothers work outside the home.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

2. Modern parents should bring up their boys and girls to believe in absolute equal rights and freedom for both sexes.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

3. Opportunities for women in mathematics and science are increasing.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

4. I can do just about anything if I <u>decide</u> to do it and can take the time.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

5. Most men don't like women who are as smart or smarter than they are.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

6. In the present and recent past every gain for women is paralleled by a corresponding loss of male freedom and status.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

7. What others think of me is as important to me as what I think of myself.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

8. A woman who stays home with her children is not a necessarily better mother than one who works outside the home.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

9. I usually say what I think even though it may not be what the group expects.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

10. If a woman is as smart as her husband, the marriage will not work.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

11. It is not important to study math beyond two or three years in high school unless you like it or want to go into the physical sciences like engineering, chemistry, physics and so on.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

12. Men have more aptitude for math than women.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

13. Jobs such as mechanic, carpenter, electrician and machinist should be left to men.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

14. An ambitious and responsible husband does not like his wife to work.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

15. I sometimes suppress my intelligence because it makes people uncomfortable.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

16. Men and women should be allowed to compete with each other in all sports.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

17. It will be better for society when women can enter any job they choose.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

18. Math is not a good field for women.

strongly disagree	moderately disagree	neither agree or disagree	moderately agree	strongly agree

19. I sometimes remain silent when I know the right answer or when I have a good idea because I don't want to call attention to myself.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

20. Most men are threatened by liberated women.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

21. Most men do not like to work for women.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

22. I usually temper my opinions and interests when I am with members of the opposite sex.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

23. Luck, rather than brains, has accounted for most of my successes.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

24. A women has a conflict in what she has to do as a woman and what she wishes to do for herself.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

25. It is difficult for me to speak up in class or ask questions because I might seem foolish.

strongly disagree | moderately disagree | neither agree or disagree | moderately agree | strongly agree

Please take a few minutes and think about what your life might be like 10 years from today and tell us about it. Remember this is a weekday. Please include activities both inside and outside the home.

We want to get in touch with you again next year to see how your plans are working out. Since many of you will be in college and others may change schools, will you please give us your home address? This information will be confidential to those on the research staff and will be used for no other purpose than to send you a questionnaire about this time next year.

Name:_____

Address:_____

City:_____ State:_____ Zip Code:_____

Phone No.:_____

APPENDIX A-2

Outline of

Interview Schedule for Teachers

1978

1. Why do you think that so many girls continue through the mathematics sequence in this school? (Check out all other possibilities with interviewee as appropriate.)

   Parents expectations for their children?

   SES factors?

   Teachers expectations?

   Special efforts to recruit by math teachers?

   Math Programs in lower schools?

   Special programs?

   Special events?

   Other?

2. If students don't take Algebra I in 8th grade or fall off the fast track in mathematics, is there any way they can get back on (and thus be able to take AP calculus in their senior year)?

3. How much and what kind of counseling with students do you do in and out of class?

4. What kinds of problems do they bring?

   Mathematics?

   Choice of college?

   Possible major?

   Career choice?

   Other?

5. Do girls and boys bring different kinds of problems to you?

6. Do you ever talk to the parents of your students?

   Under what circumstances?

7. Do you ever talk in class about the applications of the mathematics you are teaching to problems outside of school and in various occupations? Do you bring in visitors to do so?

8. Do you think this school has a effective counseling program?

   Generally, or for only some types of students?

   What about the highly able?

   What about career education programs?

   Counseling for college?

   Technical trades?

9. How do you feel about girls entering non-traditional fields?

10. Do you (or anyone in the department) have much contact with mathematics teachers in your feeder schools or with teachers who teach mathematics to younger children (to strengthen their skills, or discuss importance of mathematics for all students or the like)? (Ask teachers to expand on what, why and how.)

11. By the way, did you ever have problems with mathematics?

    What were they?

    When?

    How did you get over the hump?

APPENDIX A-3

Outline of

Interview Schedule for Counselors

1978

1. Why do you think that so many girls continue through the mathematics sequence in this school? (Check out all possibilities with interviewee as appropriate.)

   Parents expectations for their children?

   SES factors?

   Teachers expectations?

   Math Programs in lower schools?

   Career or counseling programs?

   Special programs?

   Special events?

   Other?

2. Now let's talk about how much (and what kind of) mathematics you think students should take in high school. What about the highly able? The college bound? Students heading for skilled trades or technical training?

3. Do girls need the same amount of math as boys?

4. Why do boys drop out of mathematics? (List reasons, then for each reason given ask, "How do you counsel young men who have this problem?)"

5. And now what about girls? (List reasons, then for each reason given ask, "How do you counsel young girls who have this problem?)

6. Are students assigned to counselors permanently by class, annually by class, or by initial of last name?

7. Is there a special college and/or career counselor? What are her/his activities? When does this person first talk to students about college?

8. What about the future (and college) plans of very able girls? Have you noticed any differences in the past several years? (Ask for specifics)

9. How do you feel about girls becoming engineers, physical scientists, etc.? [Cite non-traditional occupations the counselor mentions]

10. Would you recommend your able girls go to the same colleges as your able boys with similar interests? Why or why not?

11. What if a girl needs financial aid? Do you give her the same advice as you'd give a boy?

12. What about borrowing money for college? Same advice for girls and boys?

13. By the way, now much mathematics have you studied? Did you like it? Do well in it?

APPENDIX A-4

Outline of

Interview Schedule

Used With Person(s) in the Middle School

Responsible for Mathematics Placement of Students

and for Articulation With the High School

1978

1. How are students chosen to study Algebra I in Grade 8?

   Teacher recommendation?

   Standardized test?

   Local test?

   Previous ability grouping?

2. How are these criteria used?

3. Are there any problems with this selection procedure?

4. What are the advantages of accelerated mathematics for the student?

5. Are children and/or parents told what the advantages are?

6. Do parents try to get their children into the class?

   (Sex differences in children?)

7. Do parents try to get their children out of the class?

   (Sex differences in children?)

8. Could the mathematics program in this system be improved?

   How?

APPENDIX A-5

Outline of

Student Interview Schedule

1979

(For use with former 10th grade accelerated students)

1. How have things been going since I saw you last?
2. And what about math? I notice from the roster that
   a. You've signed up for AP calculus next year.
   b. You're taking_____math course next year.
   c. You're not taking math next year.
   d. You didn't take math this year.
   e. You had some trouble this year.
3. (Only for students with good grades or going on in mathematics.) Was there ever a time when mathematics was a problem for you? Think back. Did it always come relatively easy to you? (Elicit retrospective data.)
4. About how much time each week do you (did you) spend on mathematics homework?
5. Do you have a part-time job? What is it? How many hours do you work per week?
6. Do you feel you have adequate time for homework?
7. What about career plans? Have you talked with anyone at school about what you'd like to do when you finish your schooling? Whom? What did you talk about? Did you use the career center (or guidance office)? Did you discuss plans with people out of school?

8. What about your plans for the future? Have they changed much over the last year? In what ways?
9. Were there any school-related experiences that strengthened or modified your plans? What were they?
10. And what about out-of-school experiences?
11. Have you thought about where you'd like to go to college? (Where and why?)

APPENDIX A-6

As I promised last year, I am now following up all you Advanced Placement Calculus students who participated in my study funded by the National Institute of Education last year by filling out extensive questionnaires and, in some cases, by being interviewed. This year what I am asking you to do is much less time consuming and I hope more fun.

Basically I want to know how you have fared this year - which for most of you has been a year of transition from high school to college. I also want you to look back at your experiences in your high school AP Calculus course and compare it to the work you are doing in mathematics (if you are taking math) in college.

This study is longitudinal in nature; that is to say, its value lies in my being able to follow a group of you students through successive stages of your education. So filling out the questionnaire and returning it to me is vitally important. I need to have your completed questionnaire by June 20, so please take 15 minutes and do it now. The information you provide will be added to that collected last year so that we can begin to analyze the factors that inhibit or enhance students' persistence and achievement in mathematics and mathematics-laden course in college.

Please check in the appropriate places.

1. Did you take the AP Calculus examination?

   Yes_____ Grade Received_____

   No _____ Why Not?_____

2. Did you take a math course in college this year?

   Yes_____ Grade Received_____

   No _____ Why Not?_____

3. In the light of your first-year experience in college, do you think your decision to take or not to take the exam was a wise one?

   Please explain_____

   _____

   _____

4. Were you granted credit for your AP Calculus at college?

   Yes_____How Much?_____

   No _____

5. Were you granted advanced placement for your AP Calculus at college?

   Yes_____How Much?_____

   No _____

6. Were you satisfied with the college's action in response to your AP candidacy? (Refer to questions 3 and 4 above).

   Please explain_____

   _____

   _____

7. Looking back, what do you think the main effect of your participation in AP Calculus (and other AP courses) was for you <u>in high school</u>?

   Please specify course and explain _____

   _____

   _____

8. What has been the effect of your AP calculus course and other AP work in high school on your first year in college? Has it helped or hindered a smooth transition? Please identify AP course and be as specific as possible.

   _____

   _____

   _____

9. <u>For those who have continued the study of mathematics in college</u>.

   Please give a brief comparison of your AP Calculus course and math courses you have taken in college. You may want to consider such things as level of coursework, competence of teacher, teaching style, written assignments, homework required, interaction in class, availability of teacher for help outside of class.

   _____

   _____

   _____

   _____

10. Generally, has the work (in all courses) at college been more or less demanding than you expected?

More demanding_____ Less demanding_____

Comment?_____

_____

_____

11. Overall, are you happy with your choice of college? Or would you do something different if you had the chance to do it over again? Please be specific as possible.

_____

_____

_____

_____

_____

_____

Feel free to use the back of this page for additional comments or if you have specific advice for students, teachers or administrators at your high school now that you can look back on your AP experience.

But please do sign your name and give the address at which you may be reached early in the spring of next year. This is a three-year study, and thus I will be trying to contact some of you again at that time--perhaps with personal interviews at your college.

Best wishes for a happy summer!

Patricia Casserly
Project Director

Name_____

Address_____

_____

Telephone Number? _____
(if known)

Again, many thanks!
P.L.C.

APPENDIX B

Response Frequency + Chi Squares by Sex of Precoded Items on 1978 Student Questionnaire

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					0.7115
C01 GRADE					
01 9TH	1	0.27	2	0.64	
02 10TH	206	55.53	178	56.69	
03 11TH	7	1.89	5	1.59	
04 12TH	157	42.32	129	41.08	
NO RESPONSE	0	0.0	0	0.0	
					3.6053
C02 ETHNICITY					
01 WHITE	320	86.25	265	84.39	
02 BLACK	0	0.0	2	0.64	
03 SPANISH	4	1.08	6	1.91	
04 ASIAN	39	10.51	38	12.10	
05 OTHER	1	0.27	1	0.32	
NO RESPONSE	7	1.89	2	0.64	
					0.2276
C03 ONLY CHILD-					
01 NO	349	94.07	301	95.86	
02 YES	18	4.85	13	4.14	
NO RESPONSE	4	1.08	0	0.0	
					0.2623
C04 BIRTH ORDER					
01 ELDEST	102	27.49	92	29.30	
02 MIDDLE	120	32.35	105	33.44	
03 YOUNGEST	127	34.23	104	33.12	
NO RESPONSE	22	5.93	13	4.14	
					0.2106
C05 SEX OF SIBLINGS					
01 SAME	78	21.02	64	20.38	
02 OPPOSITE	80	21.56	73	23.25	
03 MIXED	191	51.48	164	52.23	
NO RESPONSE	22	5.93	13	4.14	
					3.5075
C06 # OF CHILDREN IN FAMILY					
01 1	10	2.70	10	3.18	
02 2	78	21.02	78	24.84	
03 3	107	28.84	88	28.03	
04 4	82	22.10	62	19.75	
05 5	31	8.36	34	10.83	
06 6	19	5.12	17	5.41	
07 7	18	4.85	11	3.50	
08 8, MORE	14	3.77	11	3.50	
NO RESPONSE	12	3.23	3	0.96	
					0.8659
C07 IS BEST FRIEND SAME SEX ALSO ENROLLED IN AN ACCELERATED MATH CRSE					
01 NO	174	46.90	141	44.90	
02 YES	186	50.13	161	51.27	
03 NOFRIEND	9	2.43	11	3.50	
NO RESPONSE	2	0.54	1	0.32	

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					12.4258#
C08 IS BEST FRIEND/OPPOSITE SEX ENROLLED IN ACCELERATED MATH CRSE ALSO					
01 NO	206	55.53	132	42.04	
02 YES	117	31.54	127	40.45	
03 NOFRIEND	47	12.67	54	17.20	
NO RESPONSE	1	0.27	1	0.32	
					0.7715
C09 RATE GEN SCHOLASTIC ABILITY BEST FRIEND/SAME SEX VS YOUR OWN					
01 HIGHER	44	11.86	35	11.15	
02 SAME	168	45.28	145	46.18	
03 SOME LOW	128	34.50	107	34.08	
04 MUCH LOW	20	5.39	14	4.46	
05 NOFRIEND	10	2.70	11	3.50	
NO RESPONSE	1	0.27	2	0.64	
					1.1703
C10 GEN SCHOLASTIC ABILITY BEST FRIEND/OPPOSITE SEX VS YOUR OWN					
01 HIGHER	39	10.51	36	11.46	
02 SAME	136	36.66	110	35.03	
03 SOME - LOW	126	33.96	97	30.89	
04 MUCH - LOW	14	3.77	12	3.82	
05 NOFRIEND	55	14.82	53	16.88	
NO RESPONSE	1	0.27	6	1.91	
					0.0137
C11 MOTHER - ENCOURAGED					
01 NONE	44	11.86	38	12.10	
02 SOMEWHAT	177	47.71	149	47.45	
03 MUCH	149	40.16	125	39.81	
NO RESPONSE	1	0.27	2	0.64	
					0.5111
C12 FATHER - ENCOURAGED					
01 NONE	48	12.94	37	11.78	
02 SOMEWHAT	140	37.74	110	35.03	
03 MUCH	180	48.52	163	51.91	
NO RESPONSE	3	0.81	4	1.27	
					1.5328
C13 A RELATIVE OTHER THAN IN YOUR IMMEDIATE FAMILY - ENCOURAGED					
01 NONE	228	61.46	193	61.46	
02 SOMEWHAT	94	25.34	87	27.71	
03 MUCH	43	11.59	28	8.92	
NO RESPONSE	6	1.62	6	1.91	
					0.3675
C14 A GUIDANCE COUNSELOR - ENCOURAGED					
01 NONE	184	49.60	154	49.04	
02 SOMEWHAT	127	34.23	114	36.31	
03 MUCH	55	14.82	43	13.69	
NO RESPONSE	5	1.35	3	0.96	

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					4.5556
015 A MATHEMATICS TEACHER - ENCOURAGED					
01 NONE	64	17.25	39	12.42	
02 SOMEWHAT	130	35.04	130	41.40	
03 MUCH	174	46.90	142	45.22	
NO RESPONSE	3	0.81	3	0.96	
					0.4498
016 A TEACHER (NOT MATH) - ENCOURAGED					
01 NONE	221	59.57	190	60.51	
02 SOMEWHAT	99	26.68	77	24.52	
03 MUCH	45	12.13	41	13.06	
NO RESPONSE	6	1.62	6	1.91	
					0.4529
017 A FAMILY FRIEND - ENCOURAGED					
01 NONE	235	63.34	205	65.29	
02 SOMEWHAT	93	25.07	74	23.57	
03 MUCH	32	8.63	24	7.64	
NO RESPONSE	11	2.96	11	3.50	
					5.7626
018 OLDER GIRLS OR BOYS - ENCOURAGED					
01 NONE	187	50.40	156	49.68	
02 SOMEWHAT	128	34.50	89	28.34	
03 MUCH	49	13.21	60	19.11	
NO RESPONSE	7	1.89	9	2.87	
					5.5348
019 AN ADULT NOT MENTIONED ABOVE - ENCOURAGED					
01 NONE	260	70.08	225	71.66	
02 SOMEWHAT	85	22.91	52	16.56	
03 MUCH	21	5.66	27	8.60	
NO RESPONSE	5	1.35	10	3.18	
					8.E086*
020 BOYS YOUR OWN AGE - ENCOURAGED					
01 NONE	159	42.86	164	52.23	
02 SOMEWHAT	150	40.43	118	37.58	
03 MUCH	56	15.09	28	8.92	
NO RESPONSE	6	1.62	4	1.27	
					13.6327*
021 GIRLS YOUR OWN AGE - ENCOURAGED					
01 NONE	187	50.40	116	36.94	
02 SOMEWHAT	141	38.01	138	43.95	
03 MUCH	37	9.97	51	16.24	
NO RESPONSE	6	1.62	9	2.87	
					7.0362*
022 YOUR BEST FRIEND OF THE SAME SEX - ENCOURAGED					
01 NONE	173	46.63	121	38.54	
02 SOMEWHAT	129	34.77	113	35.99	
03 MUCH	63	16.98	76	24.20	
NO RESPONSE	6	1.62	4	1.27	

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					1.7297
023 YOUR BEST FRIEND OF THE OPPOSITE SEX - ENCOURAGED					
01 NONE	231	62.26	185	58.92	
02 SOMEWHAT	100	26.95	82	26.11	
03 MUCH	34	9.16	38	12.10	
NO RESPONSE	6	1.62	9	2.87	
					1.0364
024 A BROTHER OR SISTER - ENCOURAGED					
01 NONE	161	43.40	124	39.49	
02 SOMEWHAT	99	26.68	90	28.66	
03 MUCH	107	28.84	96	30.57	
NO RESPONSE	4	1.08	4	1.27	
					8.5416*
025 MOTHER - DISCOURAGED					
01 NONE	355	95.69	290	92.36	
02 SOMEWHAT	7	1.89	16	5.10	
03 MUCH	0	0.0	3	0.96	
NO RESPONSE	9	2.43	5	1.59	
					7.5952*
026 FATHER - DISCOURAGED					
01 NONE	357	96.23	292	92.99	
02 SOMEWHAT	5	1.35	13	4.14	
03 MUCH	0	0.0	2	0.64	
NO RESPONSE	9	2.43	7	2.23	
					4.6261
027 A RELATIVE OTHER THAN YOUR IMMEDIATE FAMILY - DISCOURAGED					
01 NONE	357	96.23	296	94.27	
02 SOMEWHAT	5	1.35	11	3.50	
03 MUCH	0	0.0	1	0.32	
NO RESPONSE	9	2.43	6	1.91	
					2.4688
028 A GUIDANCE COUNSELOR - DISCOURAGED					
01 NONE	351	94.61	292	92.99	
02 SOMEWHAT	10	2.70	13	4.14	
03 MUCH	1	0.27	3	0.96	
NO RESPONSE	9	2.43	6	1.91	
					1.5195
029 A MATHEMATICS TEACHER - DISCOURAGED					
01 NONE	346	93.26	290	92.36	
02 SOMEWHAT	11	2.96	15	4.78	
03 MUCH	4	1.08	4	1.27	
NO RESPONSE	10	2.70	5	1.59	
					2.0460
030 A TEACHER (NOT MATH) - DISCOURAGED					
01 NONE	350	94.34	293	93.31	
02 SOMEWHAT	11	2.96	13	4.14	
03 MUCH	1	0.27	3	0.96	
NO RESPONSE	9	2.43	5	1.59	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
031 A FAMILY FRIEND - DISCOURAGED					0.0283
01 NONE	347	93.53	296	94.27	
02 SOMEWHAT	12	3.23	10	3.18	
03 MUCH	2	0.54	2	0.64	
NO RESPONSE	10	2.70	6	1.91	
032 OLDER GIRLS OR BOYS - DISCOURAGED					1.7030
01 NONE	324	87.33	285	90.76	
02 SOMEWHAT	34	9.16	21	6.69	
03 MUCH	2	0.54	1	0.32	
NO RESPONSE	11	2.96	7	2.23	
033 A ADULT NOT MENTIONED ABOVE - DISCOURAGED					0.5568
01 NONE	337	90.84	295	93.95	
02 SOMEWHAT	19	5.12	12	3.82	
03 MUCH	2	0.54	1	0.32	
NO RESPONSE	13	3.50	6	1.91	
034 BOYS YOUR OWN AGE - DISCOURAGED					10.2666*
01 NONE	295	79.51	273	86.94	
02 SOMEWHAT	62	16.71	28	8.92	
03 MUCH	5	1.35	8	2.55	
NO RESPONSE	9	2.43	5	1.59	
035 GIRLS YOUR OWN AGE - DISCOURAGED					3.5131
01 NONE	327	88.14	263	83.76	
02 SOMEWHAT	33	8.89	38	12.10	
03 MUCH	2	0.54	5	1.59	
NO RESPONSE	9	2.43	8	2.55	
036 YOUR BEST FRIEND OF THE SAME SEX - DISCOURAGED					3.2051
01 NONE	340	91.64	290	92.36	
02 SOMEWHAT	16	4.31	18	5.73	
03 MUCH	3	0.81	0	0.0	
NO RESPONSE	12	3.23	6	1.91	
037 YOUR BEST FRIEND OF THE OPPOSITE SEX - DISCOURAGED					0.8714
01 NONE	351	94.61	296	94.27	
02 SOMEWHAT	8	2.16	10	3.18	
03 MUCH	2	0.54	1	0.32	
NO RESPONSE	10	2.70	7	2.23	
038 A BROTHER OR SISTER - DISCOURAGED					0.2433
01 NONE	341	91.91	288	91.72	
02 SOMEWHAT	15	4.04	15	4.78	
03 MUCH	3	0.81	3	0.96	
NO RESPONSE	12	3.23	8	2.55	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
039 EXPERIENCES IN GRADE SCHOOL AFFECTED YOUR FEELINGS TOWARD MATH					9.2498*
01 NONE	129	34.77	73	23.25	
02 BAD	43	11.59	37	11.78	
03 GOOD	178	47.98	174	55.41	
NO RESPONSE	21	5.66	30	9.55	
040 INFLUENCE OF PARTICIPATION IN ON-GOING SPECIAL PROGRAMS					2.5734
01 NONE	233	62.80	179	57.01	
02 SOME	86	23.18	77	24.52	
03 MUCH	46	12.40	50	15.92	
NO RESPONSE	6	1.62	8	2.55	
041 INFLUENCE OF PARTICIPATION IN A ONE TIME ONLY SPECIAL EVENT					3.0458
01 NONE	286	77.09	226	71.97	
02 SOME	70	18.87	64	20.38	
03 MUCH	7	1.89	12	3.82	
NO RESPONSE	8	2.16	12	3.82	
042 INFLUENCE OF HAVING AN OLDER STUDENT AS A MODEL					1.7098
01 NONE	181	48.79	165	52.55	
02 SOME	120	32.35	88	28.03	
03 MUCH	62	16.71	57	18.15	
NO RESPONSE	8	2.16	4	1.27	
043 INFLUENCE OF MEMBERSHIP IN MATH OR SCIENCE CLUBS					0.6276
01 NONE	312	84.10	255	81.21	
02 SOME	34	9.16	34	10.83	
03 MUCH	15	4.04	13	4.14	
NO RESPONSE	10	2.70	12	3.82	
044 COMPETITION WITH STUDENTS FROM OTHER SCHOOLS					0.3272
01 NONE	307	82.75	255	81.21	
02 SOME	38	10.24	34	10.83	
03 MUCH	16	4.31	16	5.10	
NO RESPONSE	10	2.70	9	2.87	
045 WERE YOU INFLUENCED BY SOME PERSON/EXPERIENCE NOT RELATED TO SCHOOL					6.0620*
01 NO	237	63.88	173	55.10	
02 YES	125	33.69	135	42.99	
NO RESPONSE	9	2.43	6	1.91	
046 RATE YOUR MATH ABILITY COMPARED WITH GIRLS IN YOUR MATH CLASS					1.3804
01 POOREST	6	1.62	4	1.27	
02 BELOW-AV	27	7.28	19	6.05	
03 AVERAGE	146	39.35	135	42.99	
04 ABOVE-AV	93	25.07	80	25.48	
05 BEST	94	25.34	73	23.25	
NO RESPONSE	5	1.35	3	0.96	

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					9.6248*
047 RATE YOUR MATH ABILITY COMPARED WITH THE BOYS IN YOUR MATH CLASS					
01 POOREST	9	2.43	6	1.91	
02 BELOW-AV	27	7.28	33	10.51	
03 AVERAGE	154	41.51	130	41.40	
04 ABOVE-AV	87	23.45	89	28.34	
05 BEST	93	25.07	52	16.56	
NO RESPONSE	1	0.27	4	1.27	
					7.6019
048 MY MATHEMATICS TESTS AND EXAMS GRADES TEND TO					
01 OVEREST	6	1.62	7	2.23	
02 ACCURATE	194	52.29	164	52.23	
03 MODUNDER	139	37.47	129	41.08	
04 MUCH UND	28	7.55	9	2.87	
NO RESPONSE	4	1.08	5	1.59	
					5.5304
049 MY ENGLISH TESTS AND EXAM GRADES TEND TO					
01 OVEREST	20	5.39	10	3.18	
02 ACCURATE	231	62.26	218	69.43	
03 MODUNDER	93	25.07	71	22.61	
04 MUCH UND	23	6.20	12	3.82	
NO RESPONSE	4	1.08	3	0.96	
					3.0676
050 WILL BE OF PRACTICAL VALUE IN EARNING A LIVING					
01 DISAGREE	24	6.47	30	9.55	
02 AGREE	120	32.35	108	34.39	
03 AGREE+	225	60.65	174	55.41	
NO RESPONSE	2	0.54	2	0.64	
					5.8446
051 BASIC EDUCATIONAL VALUE					
01 DISAGRE	15	4.04	10	3.18	
02 AGREE	104	28.03	65	20.70	
03 AGREE+	249	67.12	238	75.80	
NO RESPONSE	3	0.81	1	0.32	
					8.8323*
052 NOT USED TO EARN A LIVING, PLT OF SOME USE IN DAILY LIFE					
01 DISAGREE	169	45.55	108	34.39	
02 AGREE	141	38.01	141	44.90	
03 AGREE+	57	15.36	61	19.43	
NO RESPONSE	4	1.08	4	1.27	
					3.6023
053 SOLVING MATH PROBLEMS CAN BE FUN					
01 DISAGREE	87	23.45	58	18.47	
02 AGREE	156	42.05	129	41.08	
03 AGREE+	125	33.69	124	39.49	
NO RESPONSE	3	0.81	3	0.96	

* P≥ .05

ITEMS AND ALTERNATIVES	MALES 371 FREQ	MALES 371 PERCENT	FEMALES 314 FREQ	FEMALES 314 PERCENT	CHISQ
NUMBER OF OBSERVATIONS					
Q54 DO NOT WANT TO LOSE MATHEMATICAL SKILLS					1.2630
01 DISAGREE	28	7.55	22	7.01	
02 AGREE	103	27.76	77	24.52	
03 AGREE+	235	63.34	213	67.83	
NO RESPONSE	5	1.35	2	0.64	
Q55 NEED TO TAKE THEM NOW TO BE ELIGIBLE FOR ADVANCED COLLEGE MATH CRS					3.2335
01 DISAGREE	36	9.70	43	13.69	
02 AGREE	98	26.42	86	27.39	
03 AGREE+	234	63.07	181	57.64	
NO RESPONSE	3	0.81	4	1.27	
Q56 COURSES ARE RELATED TO/NEEDED FOR INTENDED MAJOR FIELD/FUTURE WORK					14.3095*
01 DISAGREE	39	10.51	51	16.24	
02 AGREE	75	20.22	88	28.03	
03 AGREE+	253	68.19	169	53.82	
NO RESPONSE	4	1.08	6	1.91	
Q57 THEY REPRESENT CHALLENGE; THEREFORE MASTERY OF THEM IS REWARDING					12.7316*
01 DISAGREE	52	14.02	37	11.78	
02 AGREE	150	40.43	92	29.30	
03 AGREE+	166	44.74	183	58.28	
NO RESPONSE	3	0.81	2	0.64	
Q58 HIGHEST EDUCATIONAL LEVEL - YOU					5.1026
01 8TH GR	0	0.0	0	0.0	
02 SOME HS	12	3.23	5	1.59	
03 HS GRAD	1	0.27	0	0.0	
04 SOM COL	12	3.23	11	3.50	
05 COL GRAD	49	13.21	40	12.74	
06 SOMEGRAD	21	5.66	26	8.28	
07 MASTERS	148	39.89	116	36.94	
08 DOCTOR	117	31.54	106	33.76	
NO RESPONSE	11	2.96	10	3.18	
Q59 HIGHEST EDUCATIONAL LEVEL - MOTHER					3.7491
01 8TH GR	10	2.70	8	2.55	
02 SOME HS	15	4.04	16	5.10	
03 HS GRAD	116	31.27	89	28.34	
04 SOM COL	67	18.06	65	20.70	
05 COL GRAD	66	17.79	52	16.56	
06 SOMEGRAD	30	8.09	20	6.37	
07 MASTERS	41	11.05	43	13.69	
08 DOCTOR	14	3.77	9	2.87	
NO RESPONSE	12	3.23	12	3.82	

* $P \geq .05$

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
C60 HIGHEST EDUCATIONAL LEVEL - FATHER					14.3150*
01 8TH GR	9	2.43	17	5.41	
02 SOME HS	24	6.47	11	3.50	
03 HS GRAD	62	16.71	54	17.20	
04 SOM COL	48	12.94	39	12.42	
05 COL GRAD	67	18.06	42	13.38	
06 SOMEGRAD	33	8.89	23	7.32	
07 MASTERS	50	13.48	63	20.06	
08 DOCTOR	63	16.98	53	16.88	
NO RESPONSE	15	4.04	12	3.82	
C61 DISCUSS PLANS FOR CONTINUING EDUCATION WITH FRIEND/SAME SEX					36.5463*
01 NONE	26	7.01	7	2.23	
02 SOME	252	67.92	166	52.87	
03 MUCH	83	22.37	130	41.40	
04 NO COL	0	0.0	1	0.32	
05 NOFRIEND	6	1.62	9	2.87	
NO RESPONSE	4	1.08	1	0.32	
C62 DISCUSS PLANS FOR CONTINUING EDUCATION WITH BEST FRIEND/OPPOSITE SEX					6.6343
01 NONE	64	17.25	50	15.92	
02 SOME	198	53.37	146	46.50	
03 MUCH	65	17.52	72	22.93	
04 NO COL	0	0.0	1	0.32	
05 NOFRIEND	40	10.78	43	13.69	
NO RESPONSE	4	1.08	2	0.64	
C63 DISCUSS CAREER PLANS WITH BEST FRIEND OF THE SAME SEX					13.4373*
01 NONE	29	7.82	16	5.10	
02 SOME	257	69.27	189	60.19	
03 MUCH	74	19.95	97	30.89	
04 NOFRIEND	6	1.62	9	2.87	
NO RESPONSE	5	1.35	3	0.96	
C64 DISCUSS CAREER PLANS WITH BEST FRIEND OF THE OPPOSITE SEX					4.6834
01 NONE	65	17.52	49	15.61	
02 SOME	211	56.87	162	51.59	
03 MUCH	51	13.75	59	18.79	
04 NOFRIEND	40	10.78	41	13.06	
NO RESPONSE	4	1.08	3	0.96	
C65 ATTITUDES OF YOUR MOTHER TOWARD YOUR OCCUPATIONAL/CAREER GOALS					2.6545
01 FAVOR	212	57.14	187	59.55	
02 MODERATE	68	18.33	43	13.69	
03 NEITHER	22	5.93	21	6.69	
04 NOTFAVOR	7	1.89	7	2.23	
NO RESPONSE	62	16.71	56	17.83	

* $p \geq .05$

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
Q66 ATTITUDES OF YOUR FATHER TOWARD YOUR OCCUPATIONAL/CAREER GOALS					2.5925
01 FAVOR	213	57.41	169	53.82	
02 MODERATE	58	15.63	50	15.92	
03 NEITHER	22	5.93	26	8.28	
04 NOTFAVOR	13	3.50	7	2.23	
NO RESPONSE	65	17.52	62	19.75	
Q67 WHAT DO MOST OF YOUR CLOSE FRIENDS PLAN TO DO NEXT YEAR					9.5994
01 VOC TECH	0	0.0	3	0.96	
02 2 YR COL	5	1.35	5	1.59	
03 4 YR COL	156	42.05	116	36.94	
04 APPRENT	0	0.0	0	0.0	
05 WORKFULL	4	1.08	2	0.64	
06 MILITARY	3	0.81	0	0.0	
07 CONT SCH	167	45.01	164	52.23	
08 DK	17	4.58	13	4.14	
09 OTHER	7	1.89	5	1.59	
NO RESPONSE	12	3.23	6	1.91	
Q68 PARTICIPATED IN ATHLETIC TEAMS,INTRAMURALS,LETTERMANS CLUB,SPORTS CLUB					26.6217 *
01 NO	75	20.22	96	30.57	
02 YES	51	13.75	71	22.61	
03 ACTIVE	198	53.37	116	36.94	
04 LEADER	40	10.78	24	7.64	
NO RESPONSE	7	1.89	7	2.23	
Q69 CHEERLEADERS, PEP CLUB, MAJORETTES					89.9283 *
01 NO	324	87.33	200	63.69	
02 YES	7	1.89	35	11.15	
03 ACTIVE	6	1.62	42	13.38	
04 LEADER	1	0.27	20	6.37	
NO RESPONSE	33	8.89	17	5.41	
Q70 DEBATING, DRAMA, BAND, CHORUS					17.9477 *
01 NO	175	47.17	100	31.85	
02 YES	35	9.43	41	13.06	
03 ACTIVE	116	31.27	133	42.36	
04 LEADER	29	7.82	28	8.92	
NO RESPONSE	16	4.31	12	3.82	
Q71 HOBBY CLUBS SUCH AS PHOTOGRAPHY, MODEL BUILDING, ETC					18.0221 *
01 NO	209	56.33	224	71.34	
02 YES	60	16.17	39	12.42	
03 ACTIVE	63	16.98	31	9.87	
04 LEADER	16	4.31	5	1.59	
NO RESPONSE	23	6.20	15	4.78	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
072 HONORARY CLUBS SUCH AS BETA CLUB OR NATIONAL HONOR SOCIETY					11.2447*
01 NO	258	69.54	197	62.74	
02 YES	29	7.82	31	9.87	
03 ACTIVE	46	12.40	64	20.38	
04 LEADER	15	4.04	6	1.91	
NO RESPONSE	23	6.20	16	5.10	
073 MATHLETES OR MATHEMATICS COMPETITIONS					2.7291
01 NO	218	58.76	191	60.83	
02 YES	67	18.06	64	20.38	
03 ACTIVE	62	16.71	44	14.01	
04 LEADER	4	1.08	1	0.32	
NO RESPONSE	20	5.39	14	4.46	
074 SCHOOL NEWSPAPER, MAGAZINE, YEARBOOK, ANNUAL					16.1223*
01 NO	253	68.19	179	57.01	
02 YES	38	10.24	38	12.10	
03 ACTIVE	35	9.43	61	19.43	
04 LEADER	22	5.93	21	6.69	
NO RESPONSE	23	6.20	15	4.78	
075 SCHOOL MATTER CLUBS SUCH AS SCIENCE, MATHEMATICS, ETC					10.0281*
01 NO	247	66.58	195	62.10	
02 YES	51	13.75	36	11.46	
03 ACTIVE	37	9.97	58	18.47	
04 LEADER	12	3.23	11	3.50	
NO RESPONSE	24	6.47	14	4.46	
076 SERVICE CLUB, TUTORING PROJECT					29.0643*
01 NO	254	68.46	166	52.87	
02 YES	43	11.59	43	13.69	
03 ACTIVE	40	10.78	72	22.93	
04 LEADER	8	2.16	19	6.05	
NO RESPONSE	26	7.01	14	4.46	
077 SHOP COURSES OR CRAFTING					34.7225*
01 NO	213	57.41	245	78.03	
02 YES	48	12.94	19	6.05	
03 ACTIVE	81	21.83	31	9.87	
04 LEADER	5	1.35	2	0.64	
NO RESPONSE	24	6.47	17	5.41	
078 STUDENT COUNCIL, STUDENT GOVERNMENT, POLITICAL CLUB					8.5047*
01 NO	223	60.11	183	58.28	
02 YES	55	14.82	39	12.42	
03 ACTIVE	31	8.36	49	15.61	
04 LEADER	38	10.24	27	8.60	
NO RESPONSE	24	6.47	16	5.10	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					34.3866 *
079 VOC CLUBS SUCH AS FUTURE TEACHERS, EXPLORER SCOUTS, COMP SCI					
01 NO	239	64.42	261	83.12	
02 YES	26	7.01	9	2.87	
03 ACTIVE	44	11.86	20	6.37	
04 LEADER	36	9.70	7	2.23	
NO RESPONSE	26	7.01	17	5.41	
					19.4167 *
080 CHILDREN OF MOTHERS WHO STAY HOME ARE BETTER ADJUSTED THAN WORKING MOTHERS					
01 DIS+	40	10.78	59	18.79	
02 DISAGREE	54	14.56	70	22.29	
03 NEITHER	87	23.45	60	19.11	
04 AGREE	136	36.66	93	29.62	
05 AGREE+	50	13.48	30	9.55	
NO RESPONSE	4	1.08	2	0.64	
					13.3059 *
081 MORN PARENTS SHOULD BRING UP CHLDRN TO BELIEVE EQUAL RIGHTS FOR BOTH SEXES					
01 DIS+	10	2.70	8	2.55	
02 DISAGREE	50	13.48	30	9.55	
03 NEITHER	59	15.90	31	9.87	
04 AGREE	125	33.69	99	31.53	
05 AGREE+	125	33.69	143	45.54	
NO RESPONSE	2	0.54	3	0.96	
					19.5646 *
082 OPPORTUNITIES FOR WOMEN IN MATHEMATICS AND SCIENCE ARE INCREASING					
01 DIS+	1	0.27	1	0.32	
02 DISAGREE	5	1.35	2	0.64	
03 NEITHER	41	11.05	15	4.78	
04 AGREE	151	40.70	101	32.17	
05 AGREE+	169	45.55	191	60.83	
NO RESPONSE	4	1.08	4	1.27	
					7.5579
083 I CAN DO ANYTHING IF I DECIDE TO DO IT					
01 DIS+	1	0.27	5	1.59	
02 DISAGREE	7	1.89	7	2.23	
03 NEITHER	12	3.23	9	2.87	
04 AGREE	99	26.68	62	19.75	
05 AGREE+	250	67.39	226	71.97	
NO RESPONSE	2	0.54	5	1.59	
					3.6804
084 MOST MEN DON'T LIKE WOMEN WHO ARE AS SMART OR SMARTER THAN THEY ARE					
01 DIS+	53	14.29	45	14.33	
02 DISAGREE	100	26.95	71	22.61	
03 NEITHER	81	21.83	69	21.97	
04 AGREE	106	28.57	90	28.66	
05 AGREE+	28	7.55	35	11.15	
NO RESPONSE	3	0.81	4	1.27	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					30.4432 *
085 IN THE PAST EVERY GAIN FOR WOMEN IS PARALLELED BY LOSS OF MALE FREEDOM/STAT					
01 DIS+	82	22.10	114	36.31	
02 DISAGREE	113	30.46	96	30.57	
03 NEITHER	102	27.49	77	24.52	
04 AGREE	52	14.02	17	5.41	
05 AGREE+	16	4.31	4	1.27	
NO RESPONSE	6	1.62	6	1.91	
					12.7180*
086 WHAT OTHERS THINK OF ME IS AS IMPORTANT TO ME AS WHAT I THINK OF MYSELF					
01 DIS+	66	17.79	29	9.24	
02 DISAGREE	78	21.02	85	27.07	
03 NEITHER	46	12.40	32	10.19	
04 AGREE	119	32.08	110	35.03	
05 AGREE+	61	16.44	51	16.24	
NO RESPONSE	1	0.27	7	2.23	
					35.1185 *
087 WOMAN WHO STAYS AT HOME IS NOT NECESSARILY BETTER MOTHER THAN A WORKING ONE					
01 DIS+	22	5.93	8	2.55	
02 DISAGREE	40	10.78	29	9.24	
03 NEITHER	60	16.17	20	6.37	
04 AGREE	140	37.74	104	33.12	
05 AGREE+	108	29.11	149	47.45	
NO RESPONSE	1	0.27	4	1.27	
					1.0234
088 I USUALLY SAY WHAT I THINK					
01 DIS+	6	1.62	4	1.27	
02 DISAGREE	38	10.24	37	11.78	
03 NEITHER	53	14.29	49	15.61	
04 AGREE	181	48.79	149	47.45	
05 AGREE+	91	24.53	71	22.61	
NO RESPONSE	2	0.54	4	1.27	
					17.4726 *
089 IF A WOMAN IS AS SMART AS HER HUSBAND, THE MARRIAGE WILL NOT WORK					
01 DIS+	212	57.14	221	70.38	
02 DISAGREE	85	22.91	52	16.56	
03 NEITHER	57	15.36	26	8.28	
04 AGREE	5	1.35	7	2.23	
05 AGREE+	8	2.16	3	0.96	
NO RESPONSE	4	1.08	5	1.59	
					1.3544
090 NOT IMPORTANT TO STUDY MATH BEYOND TWO OR THREE YRS IN HIGH SCHOOL					
01 DIS+	52	14.02	46	14.65	
02 DISAGREE	111	29.92	101	32.17	
03 NEITHER	50	13.48	42	13.38	
04 AGREE	121	32.61	99	31.53	
05 AGREE+	34	9.16	22	7.01	
NO RESPONSE	3	0.81	4	1.27	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					86.8255 *
091 MEN HAVE MORE APTITUDE FOR MATH THAN WOMEN					
01 DIS+	122	32.88	203	64.65	
02 DISAGREE	78	21.02	57	18.15	
03 NEITHER	124	33.42	27	8.60	
04 AGREE	29	7.82	15	4.78	
05 AGREE+	9	2.43	7	2.23	
NO RESPONSE	9	2.43	5	1.59	
					58.1925 *
092 JOBS SUCH AS MECHANIC, CARPENTER, ETC SHOULD BE LEFT TO MEN					
01 DIS+	95	25.61	152	48.41	
02 DISAGREE	99	26.68	90	28.66	
03 NEITHER	72	19.41	36	11.46	
04 AGREE	72	19.41	25	7.96	
05 AGREE+	28	7.55	6	1.91	
NO RESPONSE	5	1.35	5	1.59	
					37.1600 *
093 AN AMBITIOUS AND RESPONSIBLE HUSBAND DOES NOT LIKE HIS WIFE TO WORK					
01 DIS+	89	23.99	141	44.90	
02 DISAGREE	105	28.30	75	23.89	
03 NEITHER	87	23.45	57	18.15	
04 AGREE	64	17.25	33	10.51	
05 AGREE+	17	4.58	4	1.27	
NO RESPONSE	9	2.43	4	1.27	
					4.2453
094 I SOMETIMES SUPRESS MY INTELLIGENCE BECAUSE IT MAKES PEOPLE UNCOMFORTABLE					
01 DIS+	61	16.44	67	21.34	
02 DISAGREE	65	17.52	49	15.61	
03 NEITHER	76	20.49	53	16.88	
04 AGREE	141	38.01	124	39.49	
05 AGREE+	22	5.93	15	4.78	
NO RESPONSE	6	1.62	6	1.91	
					40.0682 *
095 MEN AND WOMEN SHOULD BE ALLOWED TO COMPETE WITH EACH OTHER IN ALL SPORTS					
01 DIS+	121	32.61	41	13.06	
02 DISAGREE	108	29.11	104	33.12	
03 NEITHER	29	7.82	48	15.29	
04 AGREE	63	16.98	66	21.02	
05 AGREE+	44	11.86	49	15.61	
NO RESPONSE	6	1.62	6	1.91	
					37.5774 *
096 IT WILL BE BETTER FOR SOCIETY WHEN WOMEN CAN ENTER ANY JOB THEY CHOOSE					
01 DIS+	23	6.20	7	2.23	
02 DISAGREE	50	13.48	22	7.01	
03 NEITHER	84	22.64	58	18.47	
04 AGREE	130	35.04	96	30.57	
05 AGREE+	76	20.49	126	40.13	
NO RESPONSE	8	2.16	5	1.59	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
					90.0213 *
097 MATH IS NOT A GOOD FIELD FOR WOMEN					
01 DIS+	186	50.13	264	84.08	
02 DISAGREE	107	28.84	31	9.87	
03 NEITHER	56	15.09	9	2.87	
04 AGREE	8	2.16	3	0.96	
05 AGREE+	8	2.16	3	0.96	
NO RESPONSE	6	1.62	4	1.27	
					2.3080
098 I SOMETIMES REMAIN SILENT WHEN I KNOW THE RIGHT ANSWER					
01 DIS+	74	19.95	63	20.06	
02 DISAGREE	77	20.75	60	19.11	
03 NEITHER	45	12.13	33	10.51	
04 AGREE	140	37.74	120	38.22	
05 AGREE+	29	7.82	34	10.83	
NO RESPONSE	6	1.62	4	1.27	
					9.8139*
099 MOST MEN ARE THREATENED BY LIBERATED WOMEN					
01 DIS+	53	14.29	33	10.51	
02 DISAGREE	106	28.57	74	23.57	
03 NEITHER	97	26.15	98	31.21	
04 AGREE	100	26.95	86	27.39	
05 AGREE+	9	2.43	18	5.73	
NO RESPONSE	6	1.62	5	1.59	
					3.7899
100 MOST MEN DO NOT LIKE TO WORK FOR WOMEN					
01 DIS+	16	4.31	11	3.50	
02 DISAGREE	51	13.75	60	19.11	
03 NEITHER	86	23.18	71	22.61	
04 AGREE	163	43.94	131	41.72	
05 AGREE+	49	13.21	37	11.78	
NO RESPONSE	6	1.62	4	1.27	
					20.9218 *
101 I USUALLY TEMPER MY OPINIONS WITH MEMBERS OF THE OPPOSITE SEX					
01 DIS+	53	14.29	70	22.29	
02 DISAGREE	95	25.61	105	33.44	
03 NEITHER	75	20.22	58	18.47	
04 AGREE	124	33.42	67	21.34	
05 AGREE+	18	4.85	9	2.87	
NO RESPONSE	6	1.62	5	1.59	
					4.7754
102 LUCK, RATHER THAN BRAINS, HAS ACCOUNTED FOR MOST OF MY SUCCESSES					
01 DIS+	189	50.94	155	49.36	
02 DISAGREE	120	32.35	110	35.03	
03 NEITHER	40	10.78	24	7.64	
04 AGREE	13	3.50	13	4.14	
05 AGREE+	3	0.81	7	2.23	
NO RESPONSE	6	1.62	5	1.59	

* P≥ .05

NUMBER OF OBSERVATIONS	MALES 371		FEMALES 314		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
103 CONFLICT IN WHAT SHE HAS TO DO AND WHAT SHE WISHES TO DO					74.7202 *
01 DIS+	30	8.09	56	17.83	
02 DISAGREE	39	10.51	65	20.70	
03 NEITHER	156	42.05	45	14.33	
04 AGREE	118	31.81	117	37.26	
05 AGREE+	16	4.31	26	8.28	
NO RESPONSE	12	3.23	5	1.59	
104 IT IS DIFFICULT FOR ME TO SPEAK UP IN CLASS BECAUSE I MIGHT SEEM FOOLISH					14.4870 *
01 DIS+	116	31.27	71	22.61	
02 DISAGREE	101	27.22	73	23.25	
03 NEITHER	53	14.29	43	13.69	
04 AGREE	79	21.29	97	30.89	
05 AGREE+	18	4.85	25	7.96	
NO RESPONSE	4	1.08	5	1.59	
105 GRADE LEVEL FIRST ACCELERATED IN MATH					7.5592
01 1	9	2.43	10	3.18	
02 2	5	1.35	5	1.59	
03 3	28	7.55	18	5.73	
04 4	25	6.74	30	9.55	
05 5	23	6.20	21	6.69	
06 6	37	9.97	24	7.64	
07 7	103	27.76	98	31.21	
08 8	74	19.95	48	15.29	
09 9	31	8.36	27	8.60	
10 10	22	5.93	19	6.05	
11 11	3	0.81	1	0.32	
12 12	3	0.81	2	0.64	
NO RESPONSE	8	2.16	11	3.50	
106 ACCELERATED IN ANYTHING OTHER THAN MATH					0.5176
01 NO	140	37.74	107	34.08	
02 YES	226	60.92	194	61.78	
NO RESPONSE	5	1.35	13	4.14	
107 GRADE LEVEL FIRST ACCELERATED IN OTHER THAN MATH					13.4589
01 1	14	3.77	17	5.41	
02 2	15	4.04	12	3.82	
03 3	21	5.66	21	6.69	
04 4	8	2.16	16	5.10	
05 5	14	3.77	9	2.87	
06 6	12	3.23	8	2.55	
07 7	38	10.24	37	11.78	
08 8	11	2.96	9	2.87	
09 9	50	13.48	37	11.78	

* P≥ .05

ITEMS AND ALTERNATIVES	MALES 371 FREQ	MALES 371 PERCENT	FEMALES 314 FREQ	FEMALES 314 PERCENT	CHISQ
NUMBER OF OBSERVATIONS					
(ITEM CONTINUED)					13.4589
107 GRADE LEVEL FIRST ACCELERATED IN OTHER THAN MATH					
10 10	17	4.58	17	5.41	
11 11	18	4.85	12	3.82	
12 12	7	1.89	0	0.0	
NO RESPONSE	146	39.35	119	37.90	
					27.6006 *
108 STUDENT ASPIRATION					
01 1	46	12.40	68	21.66	
02 2	21	5.66	37	11.78	
03 3	69	18.60	64	20.38	
04 4	217	58.49	127	40.45	
NO RESPONSE	18	4.85	18	5.73	
					6.2025
109 FATHER'S OCCUPATION					
01 NO	123	33.15	116	36.94	
02 SOMEWHAT	130	35.04	84	26.75	
03 VERY	102	27.49	104	33.12	
NO RESPONSE	16	4.31	10	3.18	
					2.4523
110 MOTHER'S OCCUPATION					
01 NO	189	50.94	180	57.32	
02 SOMEWHAT	57	15.36	41	13.06	
03 VERY	14	3.77	18	5.73	
NO RESPONSE	111	29.92	75	23.89	
					1.1602
111 CONTINUANCE					
01 1	30	8.09	39	12.42	
02 2	117	31.54	113	35.99	
NO RESPONSE	224	60.38	162	51.59	
					6.8184
112 AP IN COLLEGE					
01 0	102	27.49	70	22.29	
02 1	8	2.16	5	1.59	
03 2	17	4.58	11	3.50	
04 3	39	10.51	51	16.24	
NO RESPONSE	205	55.26	177	56.37	

* $P \geq .05$

TABLE C_1

Direct and Indirect Effects and Multiple Correlations

for Tenth Grade Females

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Equalitarian Attitudes		.36			
	Mother's Education		.26		.26
	Father's Attitude		.18		.18
Occupational Stereotyping		.37			
	Peer Encouraged		.22		.22
	Mother's Education		.19		.19
	Mother's Attitude		.30		.30
Mathematics Grade		.46			
	Father Encouraged		.24		.24
	Math Teacher Encouraged		.17		.17
	Opposite Sex Friend Enrolled		.23		.23
	Mother's Attitude		-.26		-.26
Science Grade		.48			
	School Encouraged		-.22		-.22
	Math Teacher Encouraged		.28		.28
	Father's Education		.25		.25
Self Assessment of Mathematical Ability		.67			
	Equalitarian Attitudes		.15		.15
	Mathematics Grade		.63		.63
	Mother's Education			.04	.04
	Father's Attitude			.03	.03
	Father Encouraged			.15	.15
	Math Teacher Encouraged			.11	.11
	Opposite Sex Friend Enrolled			.14	.14
	Mother's Attitude			-.16	-.16
Assertiveness Scale		.57			
	Mother Encouraged		-.17		-.17
	Sibling Encouraged		.15		.15
	Father's Attitude		.22	.03	.25
	Equalitarian Attitudes		.17		.17
	Occupational Stereotyping		.35		.35
	Mathematics Grade		-.18		-.18
	Mother's Education			.11	.11
	Peer Encouraged			.08	.08
	Mother's Attitude			.15	.15
	Father Encouraged			-.04	-.04
	Math Teacher Encouraged			-.03	-.04
	Opposite Sex Friend Enrolled			-.04	-.04

TABLE C_1

Direct and Indirect Effects and Multiple Correlations

for Tenth Grade Females

(Continued)

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Persistence in Mathematics		.49			
	Father Encouraged		.17	.07	.24
	Math Teacher Encouraged		.19	.05	.24
	Grade First Accelerated		.19		.19
	Mathematics Grade		.31		.31
	Opposite Sex Friend Enrolled			.07	.07
	Mother's Attitude			-.08	-.08
Occupational Aspirations		.29			
	Self Assessment of Math Ability		.20		.20
	Equalitarian Attitudes			.03	.03
	Mathematics Grade			.40	.40
	Mother's Education			.01	.01
	Father's Attitude			.01	.01
	Father Encouraged			.03	.03
	Math Teacher Encouraged			.02	.02
	Opposite Sex Friend Enrolled			.03	.03
	Mother's Attitude			-.03	-.03
Educational Aspirations		.50			
	Other Encouraged		.18		.18
	Equalitarian Attitudes		.40		.40
	Persistence in Mathematics		.33		.33
	Father Encouraged			.08	.08
	Math Teacher Encouraged			.08	.08
	Grade First Accelerated			.06	.06
	Mathematics Grade			.10	.10
	Opposite Sex Friend Enrolled			.20	.20
	Mother's Attitude			-.03	-.03
	Father's Attitude			.07	.07
	Mother's Education			.10	.10

TABLE C_2

Direct and Indirect Effects and Multiple Correlations

for Tenth Grade Males

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Equalitarian Attitudes		.24			
	Mother's Attitude		.20		.20
Mathematics Grade		.51			
	Math Teacher Encouraged		.17		.17
	Same Sex Friend Enrolled		.22		.22
	Opposite Sex Friend Enrolled		-.19		-.19
	Mother's Education		.22		.22
	Mother's Attitude		.38		.38
Science Grade		.53			
	Math Teacher Encouraged		.24		.24
	Peer Encouraged		-.19		-.19
	Grade First Accelerated		-.17		-.17
	Same Sex Friend Enrolled		.33		.33
	Father's Education		.17		.17
	Mother's Attitude		.26		.26
Self Assessment of Mathematical Ability		.70			
	Father Encouraged		.13		.13
	Opposite Sex Friend Enrolled		.21	-.12	.09
	Father's Education		.16		.16
	Father's Attitude		.22		.22
	Mathematics Grade		.64		.64
	Equalitarian Attitude		-.12		-.12
	Math Teacher Encouraged			.11	.11
	Same Sex Friend Enrolled			.14	.14
	Mother's Attitude			.22	.22
	Mother's Education			.14	.14
Assertiveness Scale		.46			
	Father's Education		-.16		-.16
	Father's Attitude		.24		.24
	Equalitarian Attitudes		.23		.23
	Mother's Attitudes			.05	.05

TABLE C_2

Direct and Indirect Effects and Multiple Correlations

for Tenth Grade Males

(continued)

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Persistence in Mathematics		.47			
	Sibling Encouraged		-.19		-.19
	Opposite Sex Friend Enrolled		-.15	-.04	-.19
	Mathematics Grade		.27	.13	.40
	Self Assessment of Mathematical Ability		.21		.21
	Math Teacher Encouraged			.07	.07
	Same Sex Friend Enrolled			.09	.09
	Mother's Education			.09	.09
	Mother's Attitude			.15	.15
	Father Encouraged			.03	.03
	Father's Education			.03	.03
	Father's Attitude			.05	.05
	Equalitarian Attitudes			-.02	-.02
Occupational Aspirations		.42			
	Father's Attitude		.22		.22
	Persistence in Mathematics		.24		.24
	Sibling Encouraged			-.05	-.05
	Opposite Sex Friend Enrolled			-.01	-.01
	Mathematics Grade			.09	.09
	Self Assessment of Math Ability			.05	.05
	Math Teacher Encouraged			.01	.01
	Same Sex Friend Enrolled			.02	.02
	Mother's Education			.02	.02
	Mother's Attitude			.03	.03
	Father Encouraged			.01	.01
	Father's Education			.01	.01
	Father's Attitude			.01	.01
	Equalitarian Attitudes			.01	.01
Educational Aspirations		.41			
	Father Encouraged		.17		.17
	Other Encouraged		.15		.15
	Same Sex Friend Enrolled		.19		.19

TABLE C_3

Direct and Indirect Effects and Multiple Correlations for Twelfth Grade Females

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Equalitarian Attitudes		.31			
	Mother's Attitude		.21		.21
Occupational Stereotype		.37			
	Mother Encouraged		.21		.21
	Mother's Education		.26		.26
Mathematics Grade		.27			
	Math Teacher Encouraged		.25		.25
Science Grade		.31			
	Same Sex Friend Enrolled		.19		.19
Self Assessment		.60			
	Same Sex Enrolled		.25		.25
	Equalitarian Attitudes		.23		.23
	Mathematics Grade		.45		.45
	Mother's Attitude			.05	.05
	Math Teacher Encouraged			.11	.11
Assertiveness Scale		.50			
	Same Sex Friend Enrolled		.17		.17
	Father's Education		.25		.25
	Occupational Stereotype		.23		.23
	Mother Encouraged			.05	.05
	Mother's Education			.06	.06
Continued on in Mathematics		.52			
	Mother Encouraged		-.23	-.01	-.24
	Opposite Sex Friend Enrolled		.38		.38
	Science Grade		-.18		-.18
	Assertiveness Scale		-.25		-.25
	Same Sex Friend Enrolled			-.07	-.07
	Father's Education			-.06	-.06
	Occupational Stereotype			-.06	-.06
	Mother's Education			-.01	-.01
Occupational Aspirations		.36			
	School Encouraged		.22		.22
	Mathematics Grade		.21		.21
	Math Teacher Encouraged			.05	.05

TABLE C_3

Direct and Indirect Effects and Multiple Correlations

for Twelfth Grade Females

(continued)

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Educational Aspirations		.52			
	Other Encouraged		.20		.20
	Same Sex Friend Enrolled		.20		.20
	Opposite Sex Friend Enrolled		.27		.27
	Occupational Stereotype		.23		.23
	Mother Encouraged			.05	.05
	Mother's Education			.06	.06

TABLE C_4

Direct and Indirect Effects and Multiple Correlations for Twelfth Grade Males

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Equalitarian Attitudes		.34			
	Opposite Sex Friend Enrolled		.17		.17
	Father's Education		.25		.25
Occupational Stereotype		.36			
	Sibling Encouraged		-.19		-.19
	Peer Encouraged		.23		.23
	Father's Education		.18		.18
Mathematics Grade		.42			
	Peer Encouraged		-.18		-.18
	Same Sex Friend Enrolled		.34		.34
	Mother's Education		.17		.17
	Equalitarian Attitudes		.19		.19
	Opposite Sex Friend Enrolled			.03	.03
	Father's Education			.05	.05
Science Grade		.43			
	Peer Encouraged		-.25		-.25
	Same Sex Friend Enrolled		.27		.27
	Mother's Attitude		.32		.32
Self Assessment of Mathematics Ability		.63			
	Grade First Accelerated		-.14		-.14
	Same Sex Friend Enrolled		.21	.18	.39
	Mathematics Grade		.54		.54
	Peer Encouraged			-.10	-.10
	Mother's Education			.09	.09
	Equalitarian Attitudes			.10	.10
	Opposite Sex Friend Enrolled			.02	.02
	Father's Education			.03	.03
Assertiveness Scale		.51			
	Mother Encouraged		-.15		-.15
	Grade First Accelerated		-.22		-.22
	Equalitarian Attitudes		.23		.23
	Occupational Stereotypes		.23		.23
	Opposite Sex Friend Enrolled			.04	.04
	Father's Education			.10	.10
	Sibling Encouraged			-.04	-.04
	Peer Encouraged			.05	.05

TABLE C_4

Direct and Indirect Effects and Multiple Correlations

for Twelfth Grade Males

(continued)

Dependent Variables	Independent Variables	Multiple Correlations	Direct Effects	Indirect Effects	Total Hypothesized Effects
Continued on in Mathematics		.56			
	School Encouraged		-.15		-.15
	Math Teacher Encouraged		.31		.31
	Same Sex Friend Enrolled		-.22		-.22
	Mother's Attitude		-.33		-.33
	Father's Attitude		.54		.54
	Occupational Stereotypes		-.17		-.17
	Sibling Encouraged			.03	.03
	Peer Encouraged			-.04	-.04
	Father's Education			-.03	-.03
Occupational Aspirations		.40			
	Equalitarian Attitudes		-.17		-.17
	Continued on in Mathematics		.29		.29
	Opposite Sex Friend Enrolled			-.03	-.03
	Father's Education			-.05	-.05
	School Encouraged			-.04	-.04
	Math Teacher Encouraged			.09	.09
	Same Sex Friend Enrolled			-.06	-.06
	Mother's Attitude			-.10	-.10
	Father's Attitude			.16	.16
	Occupational Stereotypes			-.05	-.05
	Sibling Encouraged			.01	.01
	Peer Encouraged			-.01	-.01
Educational Aspirations		.57			
	Mother Encouraged		.30		.30
	Peer Encouraged		-.27		-.27
	Opposite Sex Friend Enrolled		.19		.19
	Father's Education		.25		.25
	Father's Attitude		.25		.25

TABLE C_5

Means and Standard Deviations for the Path Analysis Variables for Females in Tenth Grade Accelerated Mathematics Classes

GR 9-10 FEMALES

THE NUMBER OF OBSERVATIONS IS 151.

VARIABLE	SUMS	SUMS OF SQUARES	MEAN	SIGMA(N)	SIGMA(N-1)
M ENC	349.3133	876.8097	2.3133	0.6747	0.6769
F ENC	362.8054	950.5977	2.4027	0.7228	0.7252
SIB ENC	283.7384	632.3847	1.8792	0.8103	0.8130
OAS ENC	231.5671	389.4198	1.5336	0.4765	0.4781
MATH ENC	337.4698	825.9463	2.2349	0.6893	0.6915
PEER ENC	240.8606	445.3040	1.6346	0.5265	0.5283
OTH ENC	213.2271	333.5816	1.4121	0.4638	0.4653
GRD ACC	946.4185	6725.1522	6.2676	2.2923	2.2999
SSEX ENR	233.5811	389.7483	1.5270	0.4993	0.5010
OSEX ENR	233.3636	398.1529	1.5455	0.4983	0.5000
M ED	672.1397	3386.0933	4.4514	1.6154	1.6208
F ED	826.2465	5131.0676	5.4718	2.0099	2.0166
M ATT	544.3947	2133.3547	3.6053	0.6841	0.6864
F ATT	529.1812	1941.4431	3.5045	0.7587	0.7613
EQUA ATT	641.9443	2771.0326	4.2513	0.5270	0.5288
OCC STER	532.1149	1934.9186	3.5239	0.6296	0.6317
MATH GRD	498.1775	1736.1131	3.2993	0.7818	0.7844
SCI GRD	525.2168	1835.2238	3.4451	0.5341	0.5359
SELF AS	546.5298	2097.2503	3.6192	0.8891	0.8920
ASSERT	487.8422	1665.1239	3.2307	0.7674	0.7700
CON MATH	277.6377	539.8451	1.8385	0.3682	0.3695
ST OCC	417.2746	1330.3867	2.6972	1.2392	1.2434
ST ED	998.6128	6930.4691	6.6138	1.4680	1.4728

TABLE C_6

Correlation Matrix for Tenth Grade Females

CORRELATION MATRIX GR 9-12 FEMALES

	M ENC	F ENC	SIB ENC	SCH ENC	MATH ENC	PEER ENC	OTH ENC	GRD ACC	SSEX ENR	OSEX ENR
M ENC	1.0000	0.5682	1.0817	0.0930	0.0386	0.1089	0.2104	-0.1370	-0.0873	0.1042
F ENC	0.5682	1.0000	1.0857	0.0352	0.0329	0.0496	0.1663	-0.1405	-0.1793	0.0307
SIB ENC	0.0817	0.0857	1.0000	0.1771	0.1304	0.1690	0.3033	-0.0302	0.0677	0.1069
OAS ENC	0.0931	0.0352	0.1771	1.0000	0.2129	0.1111	0.2772	-0.2009	-0.0846	0.0122
MATH ENC	0.0386	0.0329	0.1304	0.2129	1.0000	0.1747	0.1726	-0.1091	-0.1126	-0.0834
PEER ENC	0.1089	0.0496	0.1690	0.1111	0.1747	1.0000	0.4181	0.0078	0.1824	0.1897
OTH ENC	0.2104	0.1663	0.3033	0.2772	0.1726	0.4181	1.0000	-0.1515	-0.1407	-0.0056
GRD ACC	-0.1370	-0.1405	-0.0302	-0.2009	-0.1091	0.0078	-0.1515	1.0000	0.1030	0.0633
SSEX ENR	-0.0873	-0.1793	0.0677	-0.0846	-0.1126	0.1824	-0.1407	0.1030	1.0000	0.3762
OSEX ENR	0.1042	0.0307	0.1069	0.0122	-0.0834	0.1897	-0.0056	0.0633	0.3762	1.0000
M ED	0.2779	0.1775	0.1086	-0.0880	0.1597	0.0087	0.1439	-0.1209	-0.1796	0.0323
F ED	0.1829	0.3048	0.0791	0.0158	0.1683	0.0004	0.1338	-0.1737	-0.1754	0.0162
M ATT	0.3061	0.2391	0.1109	0.1189	-0.0284	-0.2043	-0.1432	-0.1078	-0.1752	0.2611
F ATT	0.3340	0.3767	0.1258	0.0455	0.0433	-0.1065	-0.0871	-0.0385	-0.0483	0.2731
EQUA ATT	0.1917	0.0560	0.0709	0.0335	0.0562	-0.0381	-0.0548	-0.1684	0.0095	0.0154
OCC STER	0.1383	-0.0277	0.0512	0.0945	0.0950	0.1330	0.1403	-0.0578	-0.0264	0.0094
MATH GRD	0.1454	0.2279	0.1449	-0.1029	0.1665	0.0058	0.0728	-0.1428	0.0978	0.1362
SCI GRD	0.1533	0.1993	0.0195	-0.1191	0.2972	0.0136	0.0532	-0.1700	-0.0650	0.0068
SELF AS	0.1447	0.1461	0.0246	-0.0583	0.1851	-0.0582	-0.0801	-0.1044	0.0423	0.0767
ASSERT	-0.0364	-0.0734	0.1686	0.0495	-0.0013	0.0603	-0.0418	-0.0451	-0.0810	0.0121
CON MATH	0.1418	0.2132	0.0962	-0.1704	0.1947	-0.0022	-0.0510	0.1286	0.0387	0.1239
ST OCC	0.1007	0.0519	0.1101	-0.0227	0.0242	-0.1079	0.0249	0.0036	0.0541	0.0586
ST ED	0.2342	0.1879	0.0741	0.0209	0.1260	-0.0179	0.1520	-0.0814	0.0166	0.0753

TABLE C_7

Means and Standard Deviations
for the Path Analysis Variables
for Males in Tenth Grade Accelerated Mathematics Classes

GR 9-10 MALES

THE NUMBER OF OBSERVATIONS IS 172.

VARIABLE	SUMS	SUMS OF SQUARES	MEAN	SIGMA(N)	SIGMA(N-1)
M ENC	393.2865	970.6457	2.2865	0.6442	0.6461
F ENC	414.2249	1075.7714	2.4083	0.6743	0.6762
SIB ENC	322.5000	723.8499	1.8750	0.8323	0.8348
OAS ENC	278.6199	503.9316	1.6199	0.5530	0.5546
MATH ENC	388.2273	977.6877	2.2573	0.7673	0.7696
PEER ENC	279.7529	514.3459	1.6265	0.5873	0.5891
OTH ENC	256.4733	419.6003	1.4911	0.4648	0.4662
GRD ACC	1095.2148	7855.1984	6.3675	2.2639	2.2705
SSEX ENR	257.4788	428.4479	1.4970	0.5001	0.5015
OSEX ENR	248.0290	400.1487	1.4420	0.4970	0.4984
M ED	768.1963	3910.7837	4.4663	1.6702	1.6751
F ED	932.0259	5748.3311	5.4188	2.0144	2.0202
M ATT	609.3714	2260.7075	3.5429	0.7693	0.7715
F ATT	612.5180	2280.6848	3.5612	0.7603	0.7625
EQUA ATT	650.6442	2578.9908	3.8177	0.6475	0.6494
OCC STER	556.5404	1893.7859	3.2357	0.7353	0.7374
MATH GRD	545.8083	1959.5792	3.1737	0.8599	0.8624
SCI GRD	567.9324	1941.9127	3.3023	0.6206	0.6224
SELF AS	632.5001	2480.2500	3.6773	0.9473	0.9500
ASSERT	543.2757	1817.9993	3.1586	0.7702	0.7724
CON PATH	325.1507	631.4696	1.8904	0.3125	0.3135
ST OCC	545.7284	1960.0331	3.1728	1.1527	1.1560
ST ED	1113.8554	7645.8023	6.4759	1.5859	1.5905

TABLE C_8

Correlation Matrix
for Tenth Grade Males

CORRELATION MATRIX GR 9-1 MALES

	M ENC	F ENC	SIB ENC	SCH ENC	MATH ENC	PEER ENC	OTH ENC	GRD ACC	SSEX ENR	OSEX ENR
M ENC	1.0000	0.5965	0.1574	0.1170	0.1584	0.1650	0.2511	-0.0497	-0.1786	0.0959
F ENC	0.5965	1.0000	0.1757	0.1520	0.1191	0.1742	0.1616	-0.0381	-0.1426	0.0400
SIB ENC	0.1574	0.1757	1.0000	0.0339	0.2661	0.1333	0.1756	-0.0048	-0.0665	-0.1906
OAS ENC	0.1170	0.1520	0.0339	1.0000	0.2719	0.1875	0.2474	0.0467	0.1105	0.1959
MATH ENC	0.1584	0.1191	0.2661	0.2719	1.0000	0.2651	0.2107	0.0221	-0.0531	0.0402
PEER ENC	0.1650	0.1742	0.1333	0.1875	0.2651	1.0000	0.4508	0.0239	0.2286	0.2536
OTH ENC	0.2511	0.1616	0.1756	0.2474	0.2107	0.4508	1.0000	0.0863	-0.0545	0.0069
GRD ACC	-0.0497	-0.0381	-0.0048	0.0467	0.0221	0.0239	0.0863	1.0000	-0.1513	-0.2152
SSEX ENR	-0.1786	-0.1426	-0.0665	0.1105	-0.0531	0.2286	-0.0545	-0.1513	1.0000	0.2053
OSEX ENR	0.0959	0.0400	-0.1906	0.1959	0.0402	0.2536	0.0069	-0.2152	0.2053	1.0000
M ED	0.0815	0.0690	-0.0527	0.0085	0.0714	-0.0633	-0.1295	-0.3214	0.0665	0.1302
F ED	0.0184	0.1343	-0.0774	-0.1058	-0.0275	-0.0828	-0.1436	-0.1539	0.0000	-0.1655
M ATT	0.4367	0.3317	0.0306	0.0331	0.1219	0.1474	0.0770	-0.0232	-0.0905	-0.0849
F ATT	0.3194	0.3611	0.1482	0.1127	0.0719	0.1193	0.1241	-0.0330	-0.0908	-0.0968
EQUA ATT	0.1492	0.0823	0.0513	-0.0606	0.0403	-0.0293	-0.0900	-0.1380	0.0221	0.0341
OCC STER	-0.0231	-0.0310	-0.0468	0.0094	-0.1626	-0.0140	-0.0641	0.0453	0.1226	0.0427
MATH GRD	0.0515	-0.0187	0.0742	-0.0509	0.1806	0.0003	-0.1172	-0.0898	0.1773	-0.1234
SCI GRD	0.1314	0.1145	-0.0298	-0.0341	0.1937	-0.0310	-0.1254	-0.2453	0.2765	0.0321
SELF AS	0.1016	0.1460	0.0488	0.0310	0.1649	-0.0397	-0.1103	-0.1939	0.1531	0.0708
ASSERT	0.1237	0.1752	0.1124	0.0255	-0.0106	0.0101	0.0485	0.0336	0.0061	0.0804
CON MATH	0.0169	-0.0370	-0.1275	-0.1111	0.0932	-0.1353	-0.1283	-0.0190	0.0655	-0.1300
ST OCC	-0.0073	-0.0264	-0.0766	-0.0547	0.1044	-0.1306	0.0192	0.0921	-0.0599	-0.0671
ST ED	0.1487	0.2262	0.0264	0.0237	-0.0005	0.1662	0.1305	0.0103	0.1550	0.0364

TABLE C_9

Means and Standard Deviations
for the Path Analysis Variables
for Females in AP Calculus Classes

GR11-12 FEMALES

THE NUMBER OF OBSERVATIONS IS 113.

VARIABLE	SUMS	SUMS OF SQUARES	MEAN	SIGMA(N)	SIGMA(N-1)
M ENC	254.0000	618.0000	2.2478	0.6454	0.6482
F ENC	281.0000	743.0000	2.4867	0.6256	0.6284
SIB ENC	211.0000	475.0000	1.8673	0.8467	0.8505
OAS ENC	181.0000	321.0000	1.6018	0.5244	0.5268
MATH ENC	277.0000	727.0000	2.4513	0.6516	0.6545
PEER ENC	196.3433	376.9653	1.7353	0.5700	0.5725
OTH ENC	169.5000	286.3143	1.5000	0.5327	0.5351
GRD ACC	699.1875	4862.0695	6.1875	2.1776	2.1873
SSEX ENR	180.1504	314.4972	1.5943	0.4912	0.4934
OSEX ENR	169.5000	282.5577	1.5000	0.5005	0.5027
M ED	541.3727	2879.5151	4.7909	1.5905	1.5976
F ED	637.2793	4021.2399	5.6396	1.9444	1.9531
M ATT	415.1463	1583.2881	3.6737	0.7179	0.7211
F ATT	406.7234	1534.9153	3.6170	0.7018	0.7049
EQUA ATT	489.1191	2149.0342	4.3285	0.5312	0.5336
OCC STER	414.8066	1537.8621	3.6369	0.6237	0.6265
MATH GRD	377.0191	1322.1157	3.3364	0.7542	0.7576
SCI GRD	415.1477	1544.1751	3.6739	0.4098	0.4116
SELF AS	406.6982	1556.8191	3.5991	0.9075	0.9116
ASSERT	387.6203	1403.6147	3.4301	0.8098	0.8134
CON MATH	213.9879	386.0353	1.8052	0.3969	0.3986
ST OCC	336.9266	1164.2633	2.9817	1.1887	1.1940
ST ED	793.1561	5687.6863	7.0180	1.0397	1.0443

TABLE C_{10}

Correlation Matrix
for Females in AP Calculus Classes

CORRELATION MATRIX GR11-12 FEMALES

	M ENC	F ENC	SIB ENC	SCH ENC	MATH ENC	PEER ENC	OTH ENC	GRD ACC	SSEX ENR	OSEX ENR
M ENC	1.0000	0.5977	0.2261	0.1216	0.1760	0.2044	0.2501	-0.2105	0.0651	0.1782
F ENC	0.5977	1.0000	0.1554	-0.0026	0.2426	0.2042	0.1649	-0.1513	0.1214	0.1634
SIB ENC	0.2261	0.1554	1.0000	0.1301	0.2209	0.3168	0.3055	-0.2198	0.0613	0.0762
OAS ENC	0.1216	-0.0026	0.1301	1.0000	0.4353	0.3171	0.2785	-0.1803	-0.0641	-0.1347
MATH ENC	0.1760	0.2426	0.2209	0.4353	1.0000	0.2939	0.1839	-0.0715	0.0735	0.0490
PEER ENC	0.2044	0.2042	0.3168	0.3171	0.2939	1.0000	0.5050	-0.1970	0.1176	0.1189
OTH ENC	0.2501	0.1649	0.3055	0.2785	0.1839	0.5050	1.0000	-0.2391	-0.0121	0.0708
GRD ACC	-0.2105	-0.1513	-0.2198	-0.1803	-0.0715	-0.1970	-0.2391	1.0000	-0.1586	-0.0829
SSEX ENR	0.0651	0.1214	0.0613	-0.0641	0.0735	0.1176	-0.0121	-0.1586	1.0000	-0.0323
OSEX ENR	0.1782	0.1634	0.0762	-0.1347	0.0490	0.1189	0.0708	-0.0829	-0.0323	1.0000
M ED	0.0863	0.0227	0.0434	-0.2768	0.0504	-0.1466	-0.0395	-0.0650	0.0739	0.0531
F ED	0.1372	0.2053	0.1441	-0.2413	0.0606	-0.1612	0.0287	-0.0355	0.0662	0.1911
M ATT	0.4583	0.3195	0.1887	0.1212	0.1194	0.2283	0.2199	-0.3764	-0.0652	-0.0055
F ATT	0.3854	0.4094	-0.0365	-0.0519	0.0189	0.0811	0.1310	-0.2927	0.0257	-0.0722
EQUA ATT	0.1687	0.0857	-0.1218	-0.0016	-0.0785	-0.0245	-0.1314	0.1143	-0.0906
OCC STER	0.1926	0.0889	-0.0301	0.1015	0.0587	0.0147	0.1384	-0.1648	0.0402	0.0884
MATH GRD	0.0823	0.1098	0.0762	-0.0740	0.1597	-0.0281	0.0911	0.0179	0.1013	0.0639
SCI GRD	-0.0483	0.0471	0.0492	-0.0695	0.1285	0.0869	0.1427	-0.1125	0.1643	0.0995
SELF AS	0.1416	0.1144	0.1038	-0.0208	0.1773	0.0598	0.0348	-0.0556	0.3205	0.1332
ASSERT	0.1185	0.0838	0.0820	0.0115	0.1621	0.0449	0.0975	-0.1122	0.2196	0.1017
CON MATH	-0.1234	-0.0335	-0.1096	0.0712	-0.0712	0.0057	-0.0699	-0.0480	-0.1855	0.2553
ST OCC	-0.1362	-0.0371	-0.1299	0.0988	-0.0600	-0.0810	-0.1321	0.0011	0.0442	0.0676
ST ED	0.0466	0.1136	0.0433	0.0802	0.0687	0.1941	0.2143	-0.0688	0.2111	0.3298

TABLE C_{11}

Means and Standard Deviations
for the Path Analysis Variables
for Males in AP Calculus Classes

GR 11-12 MALES

THE NUMBER OF OBSERVATIONS IS 138.

VARIABLE	SUMS	SUMS OF SQUARES	MEAN	SIGMA(N)	SIGMA(N-1)
M ENC	312.0000	770.0000	2.2609	0.6842	0.6867
F ENC	321.0000	817.0000	2.3261	0.7139	0.7165
SIB ENC	260.0000	592.0000	1.8841	0.8693	0.8635
OAS ENC	217.0731	388.0645	1.5730	0.5812	0.5833
MATH ENC	314.3139	810.8798	2.3139	0.7225	0.7251
PEER ENC	222.9499	496.7658	1.6156	0.5778	0.5799
OTH ENC	200.6204	322.3653	1.4538	0.4717	0.4734
GRD ACC	869.7647	6248.6262	6.3024	2.1320	2.1398
SSEX ENR	224.5175	397.5294	1.6269	0.4837	0.4855
OSEX ENR	182.9048	272.7354	1.3254	0.4687	0.4704
M ED	637.6204	3304.9683	4.6204	1.6126	1.6185
F ED	736.3358	4437.1904	5.3358	1.9191	1.9261
M ATT	499.7438	1877.4153	3.6216	0.6988	0.7014
F ATT	487.4312	1827.1722	3.5321	0.8742	0.8774
EQUA ATT	545.4044	2202.6671	3.9522	0.5843	0.5864
OCC STER	446.2335	1513.3229	3.2336	0.7127	0.7153
MATH GRD	456.6941	1576.7546	3.3092	0.6894	0.6919
SCI GRD	486.3985	1742.4956	3.5246	0.4514	0.4531
SELF AS	503.1241	1959.4567	3.6241	1.0320	1.0357
ASSE .T	470.8621	1667.9571	3.4129	0.6668	0.6692
CON MATH	261.2500	507.9211	1.8933	0.3096	0.3108
ST OCC	477.8507	1769.3086	3.4627	0.9115	0.9148
ST ED	984.5373	7167.7925	7.1343	1.0207	1.0244

TABLE C_{12}

Correlation Matrix
for Males in AP Calculus Classes

CORRELATION MATRIX GR 11-12 MALES

	M ENC	F ENC	SIB ENC	SCH ENC	MATH ENC	PEER ENC	OTH ENC	GRD ACC	SSEX ENR	OSEX ENR
M ENC	1.0000	0.6863	0.2976	0.2837	0.1722	0.3517	0.3157	-0.1241	0.1682	-0.0425
F ENC	0.6863	1.0000	0.2267	0.2953	0.1112	0.3272	0.2933	-0.1835	0.1612	-0.0158
SIB ENC	0.2976	0.2267	1.0000	0.2157	0.2785	0.5000	0.4126	-0.0969	0.3119	0.0500
OAS ENC	0.2837	0.2953	0.2157	1.0000	0.2721	0.3825	0.3030	-0.4046	0.1902	-0.0567
MATH ENC	0.1722	0.1112	0.2785	0.2721	1.0000	0.3425	0.3060	-0.0997	0.0781	-0.0827
PEER ENC	0.3517	0.3272	0.5000	0.3825	0.3425	1.0000	0.5995	-0.1890	0.3826	0.1239
OTH ENC	0.3157	0.2933	0.4126	0.3030	0.3060	0.5995	1.0000	-0.0728	0.1741	-0.0539
GRD ACC	-0.1241	-0.1835	-0.0969	-0.4046	-0.0997	-0.1890	-0.0728	1.0000	-0.2153	-0.0358
SSEX ENR	0.1682	0.1612	0.3119	0.1902	0.0781	0.3826	0.1741	-0.2153	1.0000	0.2034
OSEX ENR	-0.0425	-0.0158	0.0500	-0.0567	-0.0827	0.1239	-0.0539	-0.0358	0.2034	1.0000
M ED	0.3407	0.2589	0.1069	-0.0262	-0.0529	0.0045	0.0034	-0.0435	0.1363	0.1133
F ED	0.1266	0.2288	0.0134	0.3698	-0.0456	-0.0350	-0.0793	-0.0900	0.0590	0.1142
M ATT	0.3321	0.3554	0.0682	0.1000	0.1160	0.2338	0.1880	-0.1003	0.1098	-0.2359
F ATT	0.1979	0.3235	0.1019	0.2971	0.0852	0.2334	0.1630	-0.1034	0.2048	-0.0834
EQUA ATT	-0.0104	0.1087	-0.0256	0.1221	-0.0682	-0.0021	-0.0612	-0.1296	-0.0240	0.1904
OCC STER	0.0331	0.0640	-0.0774	-0.0072	-0.0220	0.1251	0.0080	-0.1655	0.0278	0.1706
MATH GRD	0.0208	0.0538	0.0146	0.0396	-0.0182	-0.0670	-0.0624	-0.0802	0.2628	-0.0096
SCI GRD	0.1021	0.1016	0.0601	0.0742	0.0244	-0.0756	-0.0146	-0.0478	0.2029	-0.0359
SELF AS	0.1199	0.0979	0.0930	0.1451	0.0547	0.0852	-0.0177	-0.2197	0.3518	0.1114
ASSERT	-0.0911	-0.0132	-0.0270	0.0950	0.1306	0.0279	-0.0477	-0.2776	-0.0374	-0.0223
CON MATH	-0.0423	-0.0759	0.0802	-0.0192	0.2765	-0.0184	0.0945	0.0914	-0.1567	0.0204
ST OCC	0.0229	0.0148	-0.0593	-0.0827	0.0454	-0.0518	0.0171	0.0816	0.0125	-0.1271
ST ED	0.2033	0.1524	-0.0607	0.0111	0.0156	-0.0858	-0.0864	-0.0453	0.0812	0.1260

Table C_{13}

Definition of Variables

Variable Number	Definitions
1 - 7	Encouragement Variables

These seven variables are scores or mean scores derived for each student from the question "How much has each of the following persons been a source of encouragement to your participation in advanced mathematics courses?" A three-point scale of not at all, somewhat, and a great deal was used to record the students' responses.

1. Mother Encouraged (M ENC*) - This is the score for the student's perception of encouragement by his/her mother.

2. Father Encouraged (F ENC*) - This is the score for the student's perception of encouragement by his/her father.

3. Sibling Encouraged (SIB ENC*) - This is the score for the siblings.

4. Other Adult in School Encouraged (OAS ENC*) - This mean score includes the student's perception of encouragement by an adult in school other than a mathematics teacher.

5. Math Teacher Encouraged (MATH ENC*) - This is the score for the student's perception of encouragement and support from his/her mathematics teacher.

6. Peer Encouraged (PEER ENC*) - This mean score included the student's perception of encouragement and support from "Boys your own age, Girls your own age, your best friend of the same sex, and your best friend of the opposite sex."

7. Other Encouraged (OTH ENC*) - This mean score included the student's response to a family friend, older girls or boys, and an adult not mentioned above.

8 Grade First Accelerated (GRD ACC*) - This variable gives the grade level at which the student first entered enriched, accelerated, or honors mathematics courses.

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*The abbreviations in parentheses represent the variable names used in the correlation matrix.

Variable
Number Definitions

9 Same Sex Friend Enrolled (SSEX ENR*) - This gives the student's response to Question 5:

Is your best friend of the same sex also enrolled in an accelerated mathematics course:

1. No
2. Yes
3. I do not have a best friend of the same sex.

10 Opposite Sex F[illegible] Enrolled (OSEX ENR*) - This variable gives the student's respons[illegible] to Question 6:

Is your best friend of the opposite sex also enrolled in an accelerated mathematics course?

1. No
2. Yes
3. I do not have a best friend of the opposite sex.

11-12 Education - These variables are derived for each student from Question 21:

In the column under YOU, circle the number that goes with the highest level of formal education you hope to attain. Under MOTHER, circle the number that goes with the highest educational level she has attained and do the same in the column marked FATHER.

Highest Educational Level

8th grade

Some high school

High school graduate

Trade or technical beyond high school or some college

College graduate

Some graduate study beyond college but NO advanced degree

Master's degree or other professional degree that is NOT doctorate

Doctorate (Ph.D., M.D., Ed.D., D.D.S., and the like)

11. Mother's Education (M ED*) - This variable gives the mother's level of educational attainment.

Variable Number — Definitions

12. Father's Education (F ED*) - This variable gives the father's level of educational attainment.

13 Mother's Attitude (M ATT*) - This variable gives the student's response to Question 29:

Describe the attitudes of your mother toward your occupational or career goals.

1. Not supportive or favorable
2. Neither favorable nor unfavorable
3. Moderately supportive
4. Very supportive, very much in favor

14 Father's Attitude (F ATT*) - This variable gives the student's response to Question 30:

Describe the attitude of your father toward your occupational or career goals.

1. Not supportive or favorable
2. Neither favorable nor unfavorable
3. Moderately supportive
4. Very supportive, very much in favor

15-16 Student Attitudinal Items - The 25 attitudinal items at the end of the 1978 questionnaire were factor analyzed and three factors were used in the path analysis. A five-point scale of strongly disagree, moderately disagree, neither agree nor disagree, moderately agree, and strongly agree was used. (For the analysis, the scales of the following items were reversed: 1, 5, 6, 7, 10, 11, 12, 13, 14, 15, 18-25.)

15 Equalitarian Attitudes (EQUA ATT*) - This variable represents the mean score of the following items and gives a view of the student's attitude toward women's place in society.

Q6. In the present and recent past every gain for women is paralleled by a corresponding loss of male freedom and status.

Q10. If a woman is as smart as her husband, the marriage will not work.

Variable
Number Definitions

Q12. Men have more aptitude for mathematics than women.

Q13. Jobs such as mechanic, carpenter, electrician, and machinist should be left to men.

Q14. An ambitious and responsible husband does not like his wife to work.

Q18. Mathematics is not a field for women.

Q23. Luck, rather than brains, has accounted for most of my success.

This scale, as well as the occupational stereotypes and assertiveness scale, was derived from a factor analysis of a set of 25 items which were selected as potential measures of these constructs.

16. Occupational Stereotyping (OCC STER*) - This variable represents a mean score of the following items. It represents the student's view on women and work, women and mathematics, and women competing with men.

Q2. Modern parents should bring up their boys and girls to believe in absolute equal rights and freedom for both sexes.

Q11. It is not important to study mathematics beyond two or three years in high school unless you like it or want to go into the physical sciences like engineering, chemistry, physics, and so on

Q13. Jobs such as mechanic, carpenter, electrician, and machinist should be left to men.

Q16. Men and women should be allowed to compete with each other in all sports.

Q17. It will be better for society when women can enter any job they choose.

Q18. Mathematics is not a good field for women.

17 Mathematics Grade (MATH GRD*) - This variable gives the student's grade point average for the mathematics courses he or she was enrolled in during the first year of the study.

18 Science Grade (SCI GRD*) - This variable gives the student's grade point average for the science courses he or she was enrolled in during the first year of the study.

Variable Number | Definitions

19 Self-Assessment of Mathematics Ability (SELF AS*) - This variable gives the student's mean response to questions 16 and 17:

How do you rate your mathematical ability compared with the girls in your mathematics class?

How do you rate your mathematical ability compared with the boys in your mathematics class?

1. Among the poorest
2. Below Average
3. Average
4. Above Average
5. Among the Best

20 Assertiveness Scale (ASSERT*) - This variable represents a mean score of the following items. It expresses student's self-confidence and belief in himself or herself. (See variables 15-16 for complete explanation.)

Q9. I usually say what I think even though it may not be what the group expects.

Q15. I sometimes supress my intelligence because it makes people uncomfortable.

Q19. I sometimes remain silent when I know the right answer or when I have a go idea because I don't want to call attention to myself.

Q22. I usually temper my opinions and interests when I am with members of the opposite sex.

Q25. It is difficult for me to speak up in class or ask questions because I might seem foolish.

21 Continued in Mathematics or Persistence in Mathematics (CON MATH*) - This variable tells whether or not the student was enrolled in mathematics during the second year of the study.

22 Occupational Aspiration (ST OCC*) - In a four-point scale, this variable gives the degree of mathematics relatedness of a student's occupational aspirations. Because the students gave more than one response the scale is as follows:

Variable
Number Definitions

Not related: None of the student's choices are related to mathematics, i.e., secretary, journalist, etc.

Low Mix: Most of the student's options were not related or only slightly related to mathematics. For example, one student wrote, "professional sports, or a lawyer."

High Mix: Most of the students' options were somewhat or very related to mathematics. For example: One student listed, "doctor, psychotherapist, architect or a pilot."

Math Related: All of the students' options were mathematics related. For example: engineer, medicine, science, accounting, architecture, etc.

23 Educational Aspirations (ST ED*) - This variable gives the student's expectation of his ultimate educational attainment. (See variables 11-12.)